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INDICES OF PHYSIOLOGICAL MATURITY: DERIVATION AND INTERRELATIONSHIPS[1]

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One of the goals of the Guidance Study has been to determine the relative contributions of the various bio-social factors associated with normal or deviating personality development. One such factor is physiological maturity, but before its relationship to personality could be studied, a method of assessing progress along the hypothetical maturational continuum had to be evolved. This paper concerns the derivation and interrelationships of indices which could be used to this end.

In this study both external and indirect signs of an individual's progress toward maturity were considered. The search for indicators of growth rests on the belief that maturity is largely determined by endocrine factors evidenced in various discernible phenomena. With this in mind, many workers in the field have used "growth indices" to classify subjects as "early," "average," or "late" maturers. Usually one such measure, e.g., age at menarche, is utilized, perhaps with others then related to it. The scores of individuals on many variables must be studied, however, before it is possible to estimate the relative validity of any one variable. One of the objectives of the present study, therefore, was to determine the degree of generality in adolescent physical growth by means of a factorial analysis of the intercorrelations among various measures of maturation. A second objective was to use the general factor, if one should be found in such an analysis, as a criterion from which the relative efficiencies of the single measures of maturation could be evaluated. Our final goal was to assign each young person a Maturity Score which would (*a*) be based on the best single measure or combination of measures of the hypothetical factor, and (*b*) fall along a continuous rather than dichotomous dimension.

The development of the separate measures or indices of maturation is described in Section I. The factorial analysis and the derivation of maturity

[1] This study was carried out under the direction of Dr. Jean Walker Macfarlane of the Guidance Study at the Institute of Child Welfare. Special acknowledgment is due to Gene Rolfe La Forge, Marjorie P. Honzik, and Nancy Bayley for their suggestions and criticisms. The charts were drawn by Katherine Eardley.

The clerical work and statistical analyses were made available by a grant-in-aid from the U.S. Public Health Service. The data collection was made possible by financial assistance from the Laura Spellman Rockefeller Fund, the General Education Board, the Rockefeller Foundation, and the University of California.

* Deceased.

scores are to be found in Section II; Section III presents a discussion of the findings.

Group Studied

The children included in the Guidance Study constituted a representative sample of those born in Berkeley, California, in 1928 and 1929. The parents of this sample, however, have a higher educational level than is true for the United States at large (8).

The boys and girls were first brought to the Institute for a complete physical examination at the age of 21 months.[2] Age of Walking and earlier measurements of height were available from the data collected in the Berkeley Survey (11). At this time there were 252 children in the group. Following the first visit, the boys and girls were seen at yearly intervals until they were 8 years of age and at half-year intervals thereafter. By the time these individuals were 18 years old, 50 families had moved; 39 children had stopped coming to the Institute because they or their parents had lost interest in the study; and one child had died. We have measurements on from 61 to 92 boys and from 70 to 97 girls at the different age levels.

I. Development of Indices

Measures of maturity which had been used by other workers and were capable of reliable determination were selected for study. Indices used for girls were (*a*) age at menarche, (*b*) development of breasts, and (*c*) development of pubic hair; for boys, amount and patterning of pubic hair and size of penis and testes; and for both sexes, (*a*) age at reaching maximum growth, (*b*) skeletal development, (*c*) per cent of mature height, and (*d*) age of walking.

The method of assigning scores on the variables was the next problem. It was possible to score in terms of the variable itself (for example, the skeletal age an individual had attained at a given chronological age) or in terms of the chronological age at which a stated degree of maturation (i.e., a particular skeletal age) had been reached. Except in determinations of chronological ages for menarche, maximum growth, and walking, the former has been the usual practice. The latter method, i.e., scoring in terms of the chronological age at which given maturational stages were reached, was used because it had the following advantages:

1. The computation of scores in terms of "age at reaching" provided a common basis for scoring and evaluating both the continuous and the discrete vari-

[2] The anthropometric measurement program was planned by Dr. Herbert R. Stolz. The measurements covering the 18 year period were made by him and the staff physicians: Drs. George Bates, Leona Bayer, Ellen Brown, Eleanor Erickson, Ann Martin, Louis Needels, Harold Roe, Anton Schaefer, Dorothy Sproul, Charles Stevenson, Philip Van Horn, and Lotta Wolff; and by research associates and assistants: Ed Radsliff, Margaret Snyder, and R. D. Tuddenham.

ables. Thus, the skeletal and sex stages, for example, had as a "base line" a common dimension with equal intervals.

2. The means and sigmas of each variable could be calculated in chronological age units, thus permitting each subject's development on all variables to be represented on a single graph.

Following this over-all plan, an individual's chronological age score was computed for every index, and norms were calculated for each variable. Relationships between measures and ratings were determined by use of product-moment correlation coefficients.[3] In the following pages each index will be considered separately.

Age at Maximum Growth

This index is the chronological age at which the largest increment in standing height occurs during the adolescent period. The procedure is taken from Shuttleworth (14). The only departures of consequence are the use of half-yearly rather than yearly increments, and the designation of Age at Maximum Growth as the midpoint rather than the end of the age interval during which the largest increment occurred, thereby allowing errors to vary unsystematically. Taking the end of the interval as Age at Maximum Growth will increase the value of the mean age, since all errors are positive, i.e., overestimate the true value. If the midpoint is used, some errors will be positive and some negative in value and will tend to cancel out each other.

In order that a determination of reliablity could be made, two methods of designating Age at Maximum Growth were used: (*a*) *graphic* and (*b*) *arithmetic*. The *graphic method* determined rate of growth per half year by the following procedure:

1. For each individual, a graph was made with age on the horizontal axis and height increments on the vertical axis. The height increments were plotted at the age levels of the original height measurements.

2. In the typical case, the interval in question was exactly one-half year, and no correction of rate was necessary, only the midpoint correction being made, i.e., the amount of the increment being plotted at the midpoint of the age interval.

3. If, however, a height measurement had not been made exactly at the half-year interval, the increment was plotted at the end of the irregular interval and a diagonal drawn from this point to the abscissa at the beginning of the interval. From the abscissa at a point a half year to the right of the beginning of the interval, a perpendicular was erected. The ordinate value of the point of intersection of this perpendicular and the diagonal indicated the rate of growth per half year. Thus, an original increment of four centimeters occurring over a period of eight months would be plotted as a rate of growth of three centimeters

[3] Much of the arduous clerical and statistical work was done by Ben Ard, Lee Cohen, Irene Dempsey, Philip Deuel, Natalie Dukes, John Enright, Britomar Hanlon, and Toshiko Onouye.

per half year. The midpoint of the irregular interval then was designated as the locus of the increment.

4. To neutralize the remaining irregularities due to errors in measurement or to actual irregularities in growth, a relatively smooth, free-hand curve was drawn through the midpoints. The maximum of the curve was determined and the corresponding age recorded as Age at Maximum Growth.

The *arithmetic method* was suggested by Shuttleworth (14, p. 3): "If the Harvard Growth Study had obtained its measurements at quarterly or even at semiannual intervals, determinations of age at the close of the year of maximum growth in standing height would be comparatively simple. It would only be necessary to compute the successive annual increments and select the point at which the largest increment in standing height occurred." When half-yearly increments were considered singly, however, the errors of measurement were almost as large as the trends we wished to measure, but adding to each half-yearly increment the increment for the preceding half year gave yearly increments relatively larger than the errors of measurement. From these progressively shifting annual increments, the midpoint of the largest was obtained and designated Age at Maximum Growth.

Since the graphic method gave a pictorial representation of this growth pattern for each individual and equalized increments over the whole age span in question, it was used to determine Age at Maximum Growth. Its reliability was checked by comparison with the results from the arithmetic method.

Results. Among Age at Maximum Growth determinations for 86 boys, there were six instances where the difference between the two methods was greater than a half year; for the 87 girls, there also were six differing by more than a half year. Two judges inspected the graphic and arithmetic determinations to find the cause of the discrepancy in these 12 cases and to choose one of the two Age at Maximum Growth scores, the choice being based on such considerations as missing measurements, unequal intervals, and changes due to smoothed curves. This inspection revealed, in addition, that the 12 disparate cases had relatively flat increment curves.

TABLE 1

INTER-RATER AGREEMENT OF MAXIMUM GROWTH DETERMINATIONS

Cases	Boys		Girls	
	N	*r*	*N*	*r*
All determinations	86	+.80	87	+.94
Cases with greater than half-year differences omitted	80	+.96	81	+.96

Determinations of inter-rater agreement using the graphic method were made for each sex with and without the disparate cases. The results are presented in Table I. The correlation coefficients are .80 for boys and .94 for girls when based on all determinations, and .96 for both sexes when the cases with greater than half-year differences are omitted. On the basis of these data, the graphic method was used routinely to estimate Age at Maximum Growth for all cases where the difference between the two methods was less than one-half year, and the judges' choice governed the remaining 12 cases.

TABLE 2

CHRONOLOGICAL AGE AT WHICH MAXIMUM GROWTH IS ATTAINED

	Boys			Girls		
Cases	*N*	*Mean* (years)	*Sigma* (years)	*N*	*Mean* (years)	*Sigma* (years)
All cases	86	13.77	1.17	87	11.51	1.13
Minus cases with greater than .50 difference in the two determinations	80	13.75	1.07	81	11.51	1.12

Means and standard deviations of Age at Maximum Growth scores are presented in Table 2. The average Age of Maximum Growth is 11.5 years for girls and 13.8 for boys. It is interesting to note that there is virtually no difference in these results whether one considers only the smaller, more reliable groups or adds the judges' ratings for the originally discrepant cases. The distributions of Age at Maximum Growth for both sexes are shown in Figure 1, the earlier maturation of the girls being strikingly apparent.

Stages in Sexual Development

The assesment of growth in sexual development was based on the temporal sequence in which discernible changes occur in external sexual characteristics of males and females. For boys, penis size and amount and patterning of pubic hair were chosen; for girls, breast development and amount and patterning of pubic hair.

Male scale. Greulich has pointed out that: "The increase in the size of the testes and . . . penis are among the earliest detectable signs of beginning puberty. It often precedes by a year or more the first appearance of definite pubic hair. The changes in the dimensions of the male external genitalia can be recorded adequately by means of serial photographs . . ." (5, p. 67).

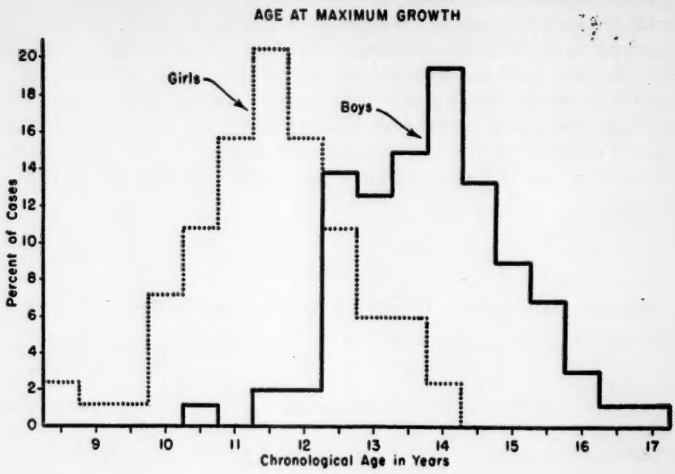

FIGURE 1

From these considerations and the study of distributions of facial and axillary hair, Greulich *et al.* developed a five-category scale to be used in rating stages of sexual maturity in boys (6, p. 15). Since his approach fitted our purposes, the five classifications plus the photographic standards were used.[4] In summary, these stages were:

Sex Stage I —Penis, testes, and scrotum are essentially the same as in early childhood.

Sex Stage II —Testes and penis have noticeably enlarged; lightly pigmented downy hair has appeared.

Sex Stage III—The penis has appreciably lengthened; downy hair is interspersed with straight coarse pigmented hair.

Sex Stage IV—Larger testes and penis of increased diameter are apparent. Pubic hair looks adult but its area is smaller.

Sex Stage V —Genitalia are adult in size and shape; pubic hair is adult.

Female scales. In girls the differential development of breasts and pubic hair necessitates the use of separate scales for each variable. After considering the breast development scales of Stratz (5, p. 66) and Reynolds and Wines (12, p. 5), the following scale was devised:

[4] Facial and axillary hair could not be rated from our photographs.

Breast Stage I —Prepuberal breast, elevated papilla only (similar to Stage I of Stratz and of Reynolds and Wines).

Breast Stage II —Elevated areola (similar to Stage II of Stratz and of Reynolds and Wines).

Breast Stage III—First swelling of the breast to a small mound formation (similar to Stage III of Reynolds and Wines).

Breast Stage IV—Terminal stage, beyond which no further *developmental* changes appear in breast contour (similar to Reynolds and Wines' Stage V).

Size and shape of breast as such were not considered. Our purpose was to chart differences meaningfully related to general physiological development, not to study the details of breast development *per se*; hence our scale, which covers only gross, readily discernible changes, was felt to be more adequate for our needs than other more discriminatory scales.

For pubic hair ratings, the five-point scale of Reynolds and Wines (12, p. 16) was used:

Hair Stage I —Infantile, no pigmented pubic hair.

Hair Stage II —Hair pigmented, straight or only slightly curled; sparse, primarily along the labia.

Hair Stage III—Hair curled; slight spread on mons.

Hair Stage IV—Hair curled; moderate amount and spread.

Hair Stage V —Hair tightly curled; profuse definite inverse triangular pattern extending to the inguinal region and corresponding to the horizontal type described by Dupertius and associates.

Nude (4½" x 7") photographs taken under standard conditions were available at half-yearly intervals from 8 through 18 years. For both sexes, judges independently rated all pictures seriatim in relation to each individual's final development, rather than on absolute standards. Inter-rater differences were determined (see Tables 3 and 4) and conference ratings were made where discrepancies occurred.

The chronological age at which an individual progressed from one stage to the next was designated by the midpoint of the age interval involved. Thus if a boy was in Sex Stage I at 12.00 years and in Sex Stage II at 12.50 years, his age at reaching Sex Stage II would be 12.25 years. Since photographs were taken routinely every half year, the intervals dealt with were most frequently .50 years.[5]

[5] When a picture was missing, however, an interpolation was made only if the age interval was no larger than 1.20 years; otherwise no attempt was made to obtain the age for the particular stage. The 1.20-year interval was in general no larger than the standard deviation of each rater's distribution (omitting the interpolated change points), and the means and standard deviations of the entire group were very close to those calculated without the interpolated data; consequently, it was believed that the gain in the number of cases justified the use of the interpolations. These also were utilized when all photos were present, but the change was so rapid that an intermediate stage had not been photographed.

TABLE 3

INTER-RATER AGREEMENT FOR RATINGS OF BOYS' SEXUAL CHARACTERISTICS BASED ON PHOTOGRAPHS

Chronological Age of Reaching	*N*	*r*
Stage II	91	+.86
Stage III	89	+.89
Stage IV	89	+.96
Stage V	79	+.86

Results. The correlations between the judges' ratings of sexual development are shown in Tables 3 and 4.[6] The inter-rater agreement on boys' scores, ranging from .86 for Stages II and V to .96 for Stage IV, seemed high enough to warrant using all these stages as indices of development. This was also true of the girls' ratings, with correlations ranging from .98 to .70, *except in the case of Hair Stage V. The low reliability of this latter stage led to its being dropped.* In order to increase the reliability of the ratings, the judges made conference ratings in all cases where discrepancies existed. These ratings, together with the original, nondiscrepant ratings, were used as final scores on the sexual indices.

TABLE 4

INTER-RATER AGREEMENT FOR RATINGS OF GIRLS' SEXUAL CHARACTERISTICS BASED ON PHOTOGRAPHS

Chronological Age of Reaching	*N**	Raters 1, 2 *r*	Raters 2, 3 *r*	Raters 1, 3 *r*
Breast Stage II	73	+.85	+.92	+.82
Breast Stage III	91	+.92	+.93	+.86
Breast Stage IV	82	+.75	+.70	+.75
Hair Stage II	88	+.94	+.98	+.93
Hair Stage III	87	+.93	+.89	+.92
Hair Stage IV	82	+.81	+.88	+.80
Hair Stage V	69	+.55	+.74	+.55

* Average of three *N*'s for the three different reliability coefficients.

[6] The ratings of the sexual characteristics were made by Ben Ard, Edith Katten, Karyl Miner, and the authors.

TABLE 5

CORRELATIONS BETWEEN THE AVERAGE OF INDEPENDENT RATINGS OF JUDGES AND THEIR FINAL RATINGS

Chronological Age of Reaching	*N*	*r*
Boys:		
Stage II	91	+.96
Stage III	89	+.96
Stage IV	89	+.98
Stage V	79	+.91
Girls:		
Breast Stage II	78	+.97
Hair Stage II	90	+.98
Breast Stage III	94	+.97
Hair Stage III	88	+.97
Breast Stage IV	87	+.95
Hair Stage IV	84	+.91

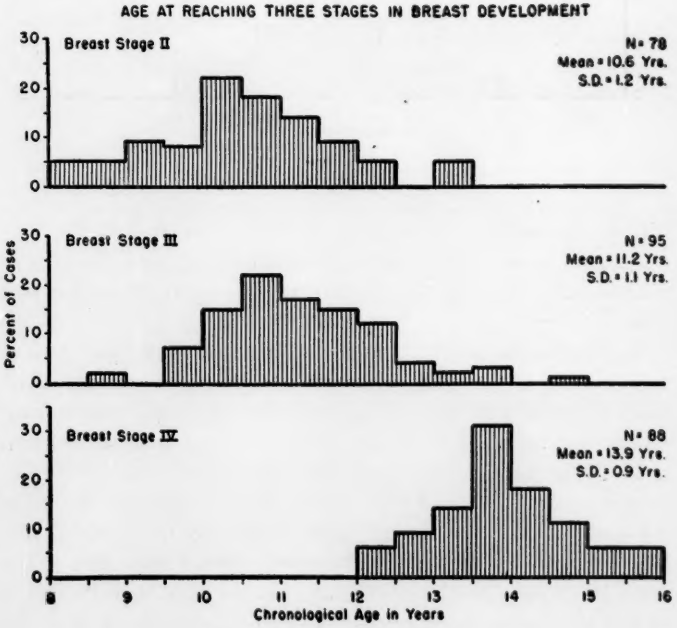

FIGURE 2

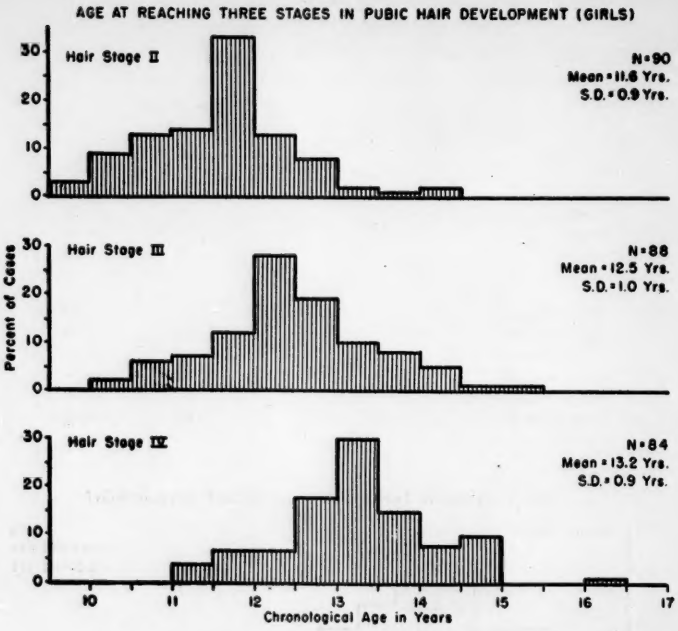

FIGURE 3

It was impossible to determine the reliability of the final ratings, since a part-whole problem exists, but their correlations with the averaged independent ratings were high (Table 5), being above .90 for all stages in both sexes.

The distributions of age at reaching the various stages in breast development and in pubic hair development are shown in Figures 2 and 3, respectively, while the distributions of age at reaching the stages in boys' sexual development are shown in Figure 4. The means and standard deviations of each stage may be found in the appropriate figures. The average boy reached Sex Stage II at 11.8 years and attained the adult stage (Sex Stage V) at 15.2 years. Our average girl began Breast Stage II (elevated areola) at 10.6 years and reached the terminal stage (Breast Stage IV) at 13.9 years. Pigmented pubic hair, characteristic of our Hair Stage II, appears in girls at 11.6 years on the average, and Hair Stage IV, the latest reliably rated stage, is reached at 13.2 years by the typical girl in this study.

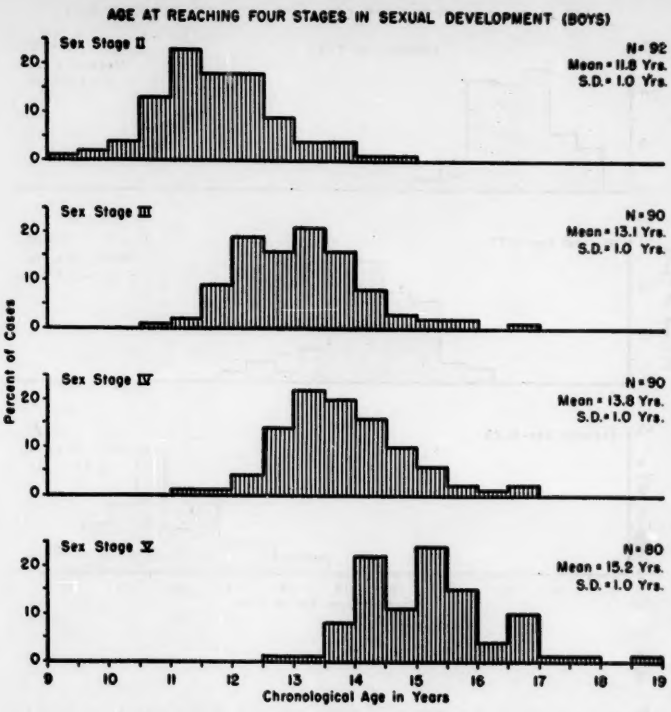

FIGURE 4

Skeletal Age Indices

Another index considered was skeletal age, or more specifically, the age at which various skeletal ages were reached. Skeletal ratings have frequently been used to distinguish early and late maturers (2, 7, 13).

X-rays of hand and knee, taken at half-yearly intervals from 8 to 18 years, had been rated[7] prior to this study according to the Todd standards, which are spaced at six-month intervals. Frequently, where an X-ray fell between standards in degree of maturity, ages were interpolated at approximately two-month intervals. For ease in statistical analysis, these ages were converted into decimals of a year. An individual's skeletal age then was found by averaging the hand and knee ages.

[7] By Nancy Bayley and Ed Radsliff.

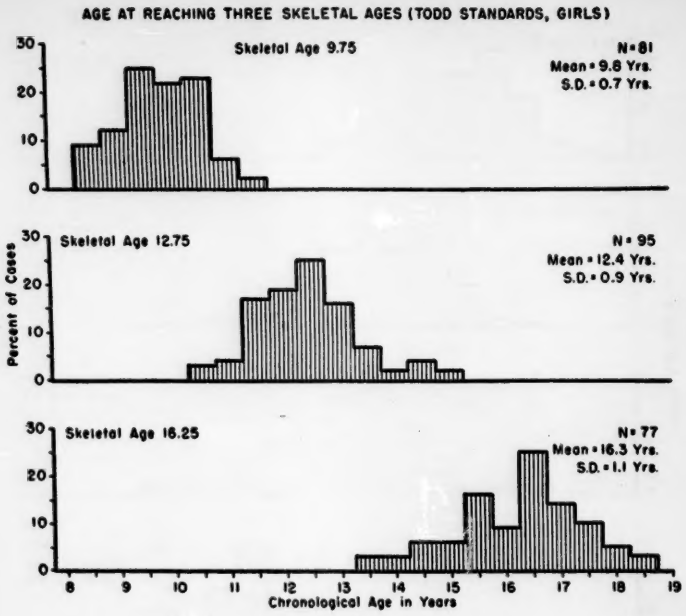

FIGURE 5

In order to arrive at a suitable skeletal index, it was necessary to find the average chronological age at which various skeletal ages were reached. The skeletal ages[8] used were chosen for the following reasons:

[8] Finding the chronological age at which a stated Skeletal Age was reached involved interpolation of both skeletal and chronological ages by means of the following formula:

$$I = \frac{b'(a-R) + a'(R-b)}{a-b}$$

where

I is the interpolated chronological age at which a given Skeletal Age was reached,
R is the stipulated Skeletal Age,
a is the recorded Skeletal Age closest to and following R,
b is the recorded Skeletal Age closest to and preceding R,
a' is the chronological age at the time a was taken,
b' is the chronological age at the time b was taken.

This method does not require that a person be X-rayed at exactly half-yearly intervals. Interpolation intervals of both 1.00 and 1.30 years were calculated and compared. Because the differences were slight, all interpolations of intervals not exceeding 1.30 years were retained.

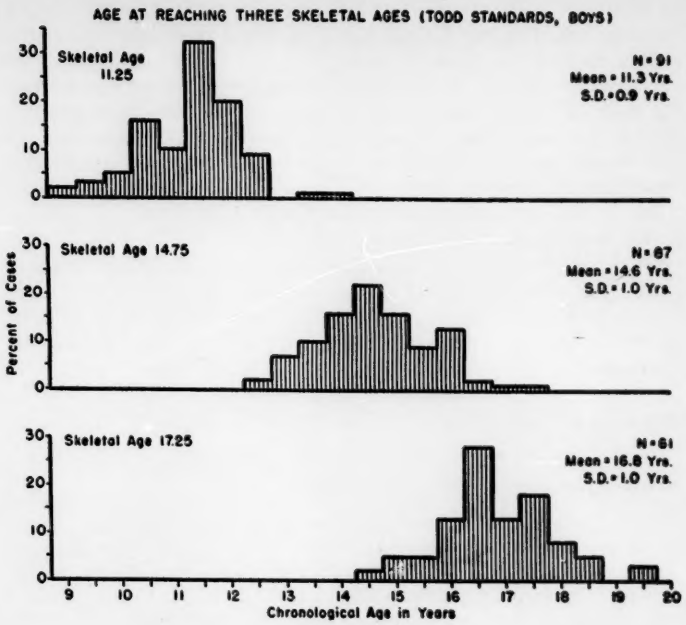

FIGURE 6

1. For girls, Skeletal Age 9.75 was the Skeletal Age which would reflect the growth status just prior to the maximum growth spurt. The equivalent Skeletal Age chosen for boys was 11.25.[9]

2. For girls, the next Skeletal Age was 12.75, an age close to the average chronological age at menarche. In boys, the developmentally equivalent age was selected, 14.75.

3. The final skeletal stage for girls was, by Todd standards, a Skeletal Age of 16.25. In boys, however, the Skeletal Age at which complete closure of the epiphyses occurs (18.75) was not used, because many of our cases had not attained this growth by the time routine data collection ceased. Following Bayley (2), Skeletal Age 17.25 was used as the final stage. This is so close to mature status that subsequent changes may be considered slight.

The means, standard deviations, and distribution of scores are shown in Figures 5 and 6. It should be noted that the largest discrepancy between

[9] Based on unpublished developmental age equivalents made available to us by Dr. Nancy Bayley.

a Skeletal Age and the corresponding chronological age occurs at the last stage in boys. This may indicate that the sample at these ages was curtailed on the Skeletal Age dimension. Some of the late maturers had not reached Skeletal Age 17.25 by 18 years when routine data collection ceased. Many of these individuals were seen a year or more later, but frequently they had by then reached skeletal maturity. In such cases the chronological age of skeletal maturity could not be ascertained; hence, no interpolation to find Skeletal Age 17.25 was possible. These considerations apply to certain other measures to be discussed. (See Section III.)

For boys, the chronological age at which Skeletal Age 11.25 was reached was compared with the Skeletal Age attained at a chronological age of 11.34 (the mean chronological age for 11.25) in order to see if these methods of handling the data were substantially different. The resulting correlation coefficient of +.94 indicates a high degree of agreement between the methods.

Per Cent of Mature Height

The use of Per Cent of Mature Height as a measure of maturity has several advantages and one major drawback:

1. It is based on growth in standing height, a relatively consistent measure (2, p. 31). The data on inter-age correlations for both sexes show consistent relationships between height at earlier ages and adult height, although the correlations for wide temporal spans are less than those for the late adolescent period.
2. The use of Per Cent of Mature Height rather than height itself gives a measure in which growth is relative to the individual, and actual size is disregarded.
3. This index may be related to similar data from the preadolescent period.
4. Per Cent of Mature Height cannot be calculated until growth in height has been completed.

Per Cent of Mature Height was obtained for each individual by determining the standing height measurement at the time of skeletal maturity, then calculating the percentage of this figure which occurred at any given age. Three types of mature height estimates were involved:

1. If height as measured fluctuated after skeletal maturity, an average of these fluctuating heights was designated "mature height."
2. If measurements continued to increase after skeletal maturity, the largest was designated "mature height."
3. If no mature X-ray had been taken, "mature height" was predicted using Bayley's tables (3). This was done for 35 per cent of boys and 15 per cent of girls.

On this basis, each boy's and girl's Per Cent of Mature Height at yearly and, after eight years, half-yearly intervals was calculated. In order to obtain scores comparable in form to the other indices, it was necessary to find the chronological age at which an individual reached certain stated per

TABLE 6

MEAN AGE OF REACHING VARIOUS PER CENTS OF MATURE HEIGHT

Per Cent of Mature Height	BOYS N	BOYS Mean Age	BOYS S.D.	GIRLS N	GIRLS Mean Age	GIRLS S.D.
45	72	1.3	.24	70	1.0	.19
50	66	2.2	.32	80	1.7	.22
55	84	3.3	.34	74	2.5	.34
60	87	4.6	.40	90	3.6	.36
65	88	5.9	.45	92	4.7	.41
70	86	7.3	.49	97	5.9	.47
75	83	8.9	.54	96	7.2	.52
80	92	10.6	.64	91	8.8	.58
85	90	12.3	.79	93	10.1	.68
90	89	13.7	1.04	93	11.4	.78
95	87	14.7	.98	91	12.5	.88
99	61	16.4	1.06	77	14.6	.90

cents of mature height. This involved the same method and formula for interpolation as presented for skeletal indices.[10]

An adequate number of cases was not available for normative purposes at ages earlier than 18 months. The first possible Per Cent of Mature Height in our data at 18 months was 45. The ages were calculated at which every fifth per cent increment was reached from 45 per cent on. The index, 99 per cent, was used rather than 100 per cent because growth is so slow at this time that rounding fractions to 100 per cent entailed the use of large age intervals giving possibly spurious results.

To compare the findings of this method of assigning Per Cent of Mature Height with those obtained by the more common practice of using the average Per Cent of Mature Height reached by a certain age, a test was made on girls' data:

1. Two determinations were made for each case. By interpolation the Per Cent of Mature Height at 12.44[11] was obtained and the mean calculated..
2. The chronological age at which each case reached 94.6 per cent (the mean Per Cent of Mature Height of chronological age 12.44) of mature height was determined by interpolation.

[10] In this instance, some of the symbols take on new meanings:
R is the stipulated Per Cent of Mature Height,
a is the recorded Per Cent of Mature Height closest to but just higher than *R*,
b is the recorded Per Cent of Mature Height closest to but just lower than *R*.

[11] Used because it is the mean chronological age of Skeletal Age 12.75, one of our other standards.

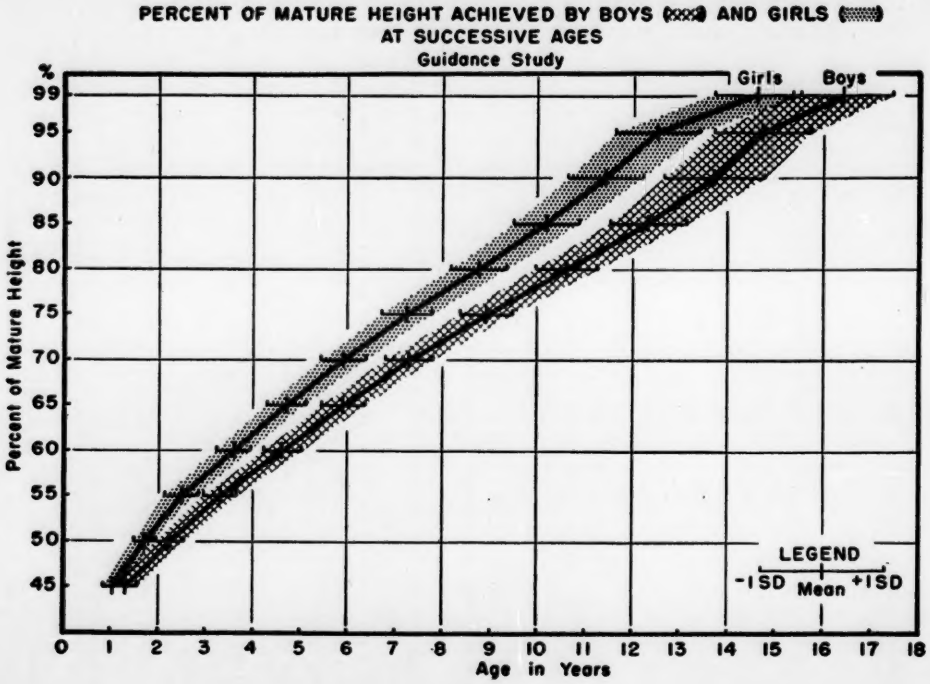
PERCENT OF MATURE HEIGHT ACHIEVED BY BOYS AND GIRLS AT SUCCESSIVE AGES
Guidance Study
Girls
Boys
%
99
95
90
85
80
75
70
65
60
55
50
45
Percent of Mature Height
LEGEND
-1SD Mean +1SD
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Age in Years

FIGURE 7

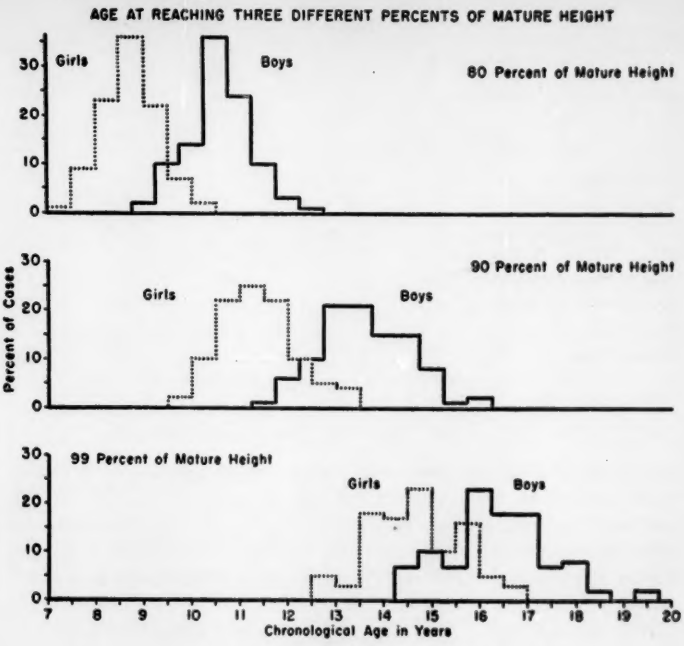

FIGURE 8

A correlation coefficient of +.97 between these two measures indicates substantial agreement between methods.

Data were used when the intervals (*a*) below two years of age were not greater than .5 years, (*b*) between two and three years were not larger than 1.1 years, (*c*) at all other ages were no larger than 1.25 years. The mean chronological ages for the various Per Cents of Mature Height are presented in Table 6. The norms at the late stages are liable to bias owing to the elimination of late maturers. (See Section III.)

Figure 7 gives a graphic portrayal of the course of growth in Per Cent of Mature Height for both sexes by means of "growth tracks" which clearly indicate the earlier maturing of the girls. Figure 8 presents the distributions of the scores of both sexes on three Per Cents of Mature Height which occur near to or during adolescence. These particular indices are included among those studied by means of the factorial analysis reported in Section II.

Age at Menarche

It has long been recognized that age at menarche "is the reflection of a physiological state which may occur at different times during the puberal

TABLE 7

AGE OF MENARCHE AS REPORTED IN VARIOUS STUDIES*

Studies	*N*	*Mean* (in years)	*S.D.*
Brush Foundation	200	12.6	1.1
Harvard Growth Study	248	13.0	1.1
Chicago Laboratory School	487	13.5	1.1
Hebrew Orphan Asylum	185	13.5	1.1
Horace Mann (Hebrew)	116	13.1	1.2
Horace Mann (Non-Hebrew)	236	13.1	1.2
Fels Institute	49	12.9	1.4
Present Study	91	12.8	1.1

* Abstracted from (2, p. 10).

period in different individuals and which usually precedes by a considerable interval the attainment of the capacity to reproduce" (5, p. 54). Although menarche itself cannot be considered an entirely satisfactory criterion of maturity (5, p. 2), it is readily obtainable, and because of its connection with endocrine factors, it is related to general physiological maturation.

In many studies a report of age at menarche is of necessity retrospective. In this longitudinal study the data were gathered shortly after the event.

TABLE 8

CORRELATIONS BETWEEN MENARCHE AND OTHER VARIABLES FROM THE GUIDANCE STUDY AND OTHER SOURCES

Variable Correlated with Menarche	*r*	*r*
Age at Maximum Growth	.71*	.70§
Skeletal Age 13.0	.84*†	.85‡|
Breast Stage II	.74*	.86¶
Hair Stage II	.74*	.70¶

* Guidance Study.
† Skeletal Age 12.75.
‡ Sign reversed to facilitate comparison.
§ Shuttleworth (14).
|| Brush Foundation (15).
¶ Reynolds and Wines (12).

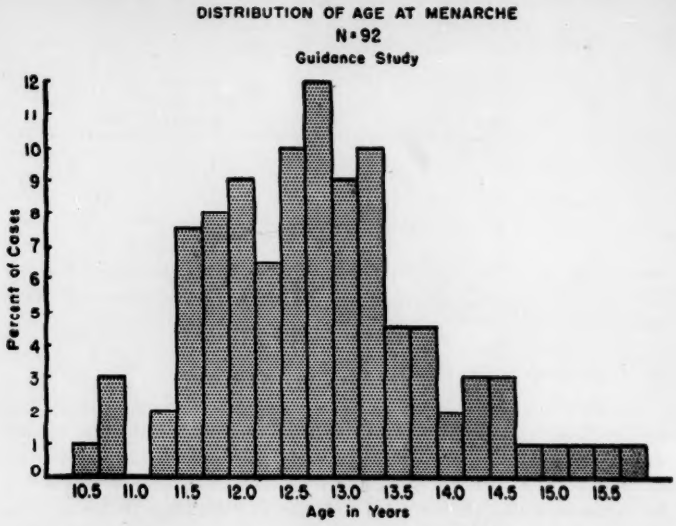

FIGURE 9

Our results are compared with those from other studies in Table 7, the 91 girls in this study having an average age at menarche of 12.8 years. The distribution of the individual ages is shown in Figure 9. The comparisons between different samples are interesting not only in regard to means, which vary from 12.6 years for the Brush Foundation sample to 13.5 for the Chicago Laboratory School and the Hebrew Orphan Asylum, but also in respect to the correlations between menarche and other growth variables shown in Table 8. The similarity between our results and those from other groups indicates the representativeness of our sample.

Age of Walking

It was our intention in this study to cover as wide an age range as was possible, hence we included data on Age of Walking, although current theory (4) would lead to the expectation that this variable would not correlate significantly with our other measures. Such proved to be the case, but the results are worth presenting in their own right. The data were obtained from records collected at the time the phenomenon occurred (11, p. 168).

The results are presented in Table 9 and are very similar to those reported elsewhere (1, 10). The mean Age of Walking for boys is 13.5 months and 13.6 months for girls. Table 10 shows several of the typically low correla-

TABLE 9

MEAN AGE OF WALKING

Sex	N	Mean Age (months)	S.D.
Boys	114	13.5	2.1
Girls	123	13.6	2.1

tions obtained between Age of Walking and other growth variables, which indicated that Age of Walking should not be used in the matrices of intercorrelations which were factored as described in Section II.

Sex Differences

The differences between the sexes in rate of maturation have already been seen in those figures which permit direct comparison. In the one variable studied over the entire age span of the study, "Per Cent of Mature Height," the consistently earlier development of the girls is clearly shown (Figure 7). Sex differences increase with each increase in chronological age until 90 Per Cent of Mature Height is reached. The mean age at that level for boys is 13.7 years, for girls 11.4 years, the difference being two and one-third years. After this level differences tend to become smaller.

TABLE 10

CORRELATION BETWEEN AGE OF WALKING AND OTHER INDICES

Index Correlated with Age of Walking	N	r
Boys:		
Age at Maximum Growth	85	—.05
45 Per Cent of Mature Height	70	.01
Skeletal Age 11.25	89	—.21
Sex Stage II	92	—.19
90 Per Cent of Mature Height	89	—.12
Girls		
Age at Maximum Growth	87	.22
45 Per Cent of Mature Height	70	—.05
Skeletal Age 9.75	81	.19
Breast Stage II	78	.17
90 Per Cent of Mature Height	93	.02
Hair Stage II	91	.12

These differences, however, are affected by the fact that mature girls not only finish growing earlier than mature boys, but also are shorter than the boys. Until chronological age 12 years, on the other hand, the average girl and boy in this sample have virtually the same height. The numerator of the fraction which determines Per Cent of Mature Height at a given age prior to 12 years, therefore, is likely to be the same for both sexes, but the denominator (terminal height) is quite different for boys and girls. Nevertheless, the relationships between the early Per Cents of Mature Height and other measures of maturation indicate the validity of the former index.

Age at Maximum Growth, a variable which is independent of the disparity in the terminal heights of the sexes, is a better measure of the earlier maturation of the girls. Maximum growth occurs on the average at 11.5 years in girls and at 13.8 years in boys, a difference of two and one-third years between the sexes.

No comparison is possible for Skeletal Age scores, since the standards are different for the sexes. The same is true in respect to ratings of sexual development, but the first discernible signs of external sexual change occur at 10.6 years in girls and not until 11.8 years, on the average, in boys. The difference between the means is one and one-quarter years in this case.

These differences between the sexes are consistent with the reports in the literature. With the exception of age of walking, sex comparisons indicate that the girls mature earlier than the boys from 21 months to 18 years.

Individual Growth Records

For summary presentation of the entire growth records of individuals, growth charts were devised for boys and girls. (See Figures 10 and 11.) An individual's record plotted on one of these charts shows at a glance his standing with respect to his group and his own variability, if any, among the measures used.[12]

II. Interrelations of Indices

In view of the fact that different workers have used various single measures as indicative of maturity, it seemed important to check the relationships among these measures and to determine the generality of the adolescent growth phenomenon. A factorial analysis of correlations between our variables should lead to a clear statement of generality. Such an analysis would, in addition, facilitate making optimal use of data in assigning maturity scores to individuals. Two questions needed answering in this connection. First, how much of the variance in the measures could be attributed to the operation of a general factor? Second, how well did each index measure this factor?

[12] These 11" x 17" charts lose visual clarity when reduced to journal page size.

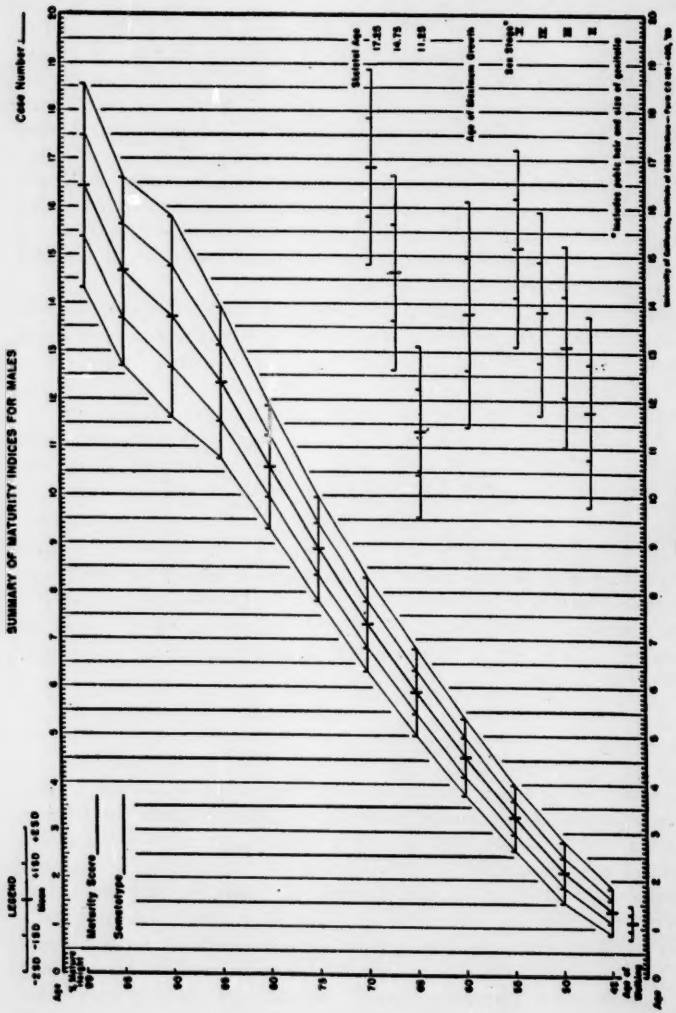
SUMMARY OF MATURITY INDICES FOR MALES
Case Number
LEGEND
Maturity Score
Somatotype
Skeletal Age
17.25
14.75
11.25
Age of Maximum Growth
Sex Stage*
* Includes pubic hair and size of genitalia

FIGURE 10

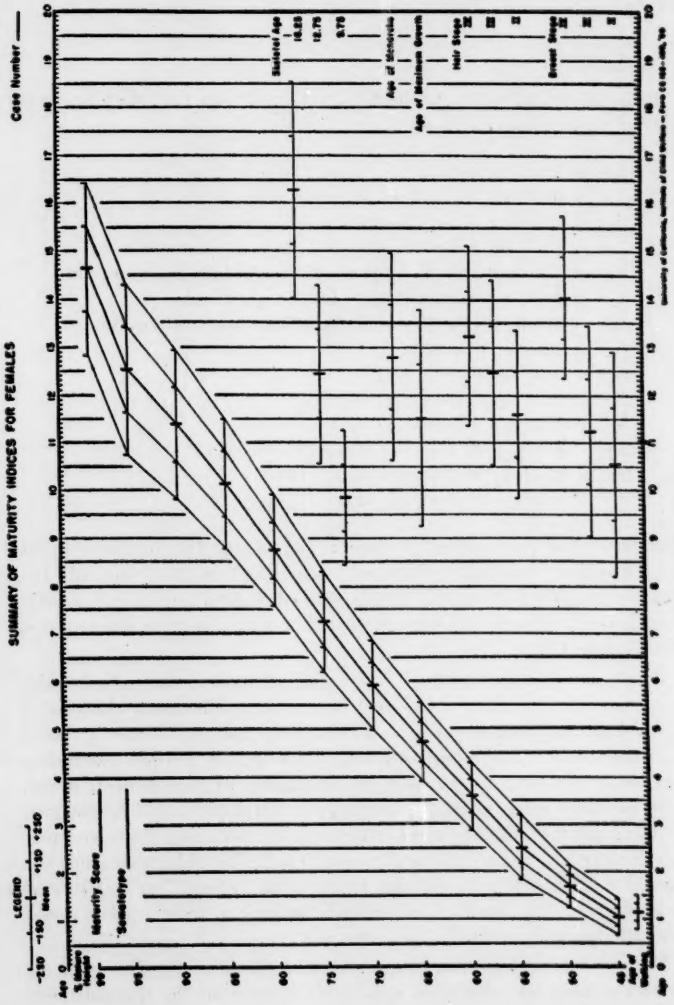
SUMMARY OF MATURITY INDICES FOR FEMALES
Case Number
LEGEND
Maturity Score
Somatotype
Skeletal Age
Age of Menarche
Age of Maximum Growth
Hair Stage
Breast Stage

FIGURE 11

Correlation matrices of boys' and girls' indices were factored using Spearman's formula.[13] The procedures and results will be described separately for each sex.

Girls' Matrix

Fourteen indices were computed for each girl from the following measures of adolescent maturation:

Age at Menarche
Age at Reaching Breast II —Elevated areola
Age at Reaching Breast III—Small mound formation
Age at Reaching Breast IV—Terminal stage of breast contour
Age at Reaching Hair II —Pigmented, straight hair. Sparse amount
Age at Reaching Hair III—Curled hair. Larger amount
Age at Reaching Hair IV—Moderate amount and spread of hair
Age at Maximum Growth
Age at Reaching Skeletal Age 9.75
Age at Reaching Skeletal Age 12.75
Age at Reaching Skeletal Age 16.25
Age at Reaching 80 Per Cent Mature Height
Age at Reaching 90 Per Cent Mature Height
Age at Reaching 99 Per Cent Mature Height

Two of these stages (9.75 and 80 Per Cent of Mature Height) occur in the early stages of adolescence. The correlations based on chronologically late measures (99 Per Cent of Mature Height and Skeletal Age 16.25) possibly were lowered through the elimination of late maturers from these groups. (See Section III.)

Owing to difficulties involved in longitudinal studies, the coefficients between each pair of tests were based on varying numbers of children. It would have been possible to select a core group, but such a sample would have been small. Since no systematic factors related to physical maturation appeared responsible for an individual's missing an appointment, it was believed that a better estimate of the population values could be obtained by using all the available cases; therefore, in calculating the correlation between any two indices, all the data were used. This did not preclude the possibility of curtailment affecting the terminal indices, but it restricted such effects to the later indices, whereas forming a "core" group would have affected every index in the factor matrix.

The matrix of intercorrelations is shown in Table 11 together with the number of cases for each coefficient. Table 12 presents the residuals after Factor A had been extracted. Some of these appear significantly different

[13] (16) Formula 21, Appendix.

TABLE 11

GIRLS' MATRIX

(Number of cases for each coefficient shown in parentheses)

	B-II	B-III	B-IV	H-II	H-III	H-IV	MGA	9.75	12.75	16.25	80%	90%	99%
	r	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*
Menarche	.741	.755	.709	.739	.715	.688	.710	.638	.845	.587	.687	.861	.719
	(68)	(83)	(84)	(79)	(81)	(78)	(82)	(69)	(87)	(73)	(80)	(83)	(74)
Breast Stage II	...	.930	.747	.752	.635	.575	.797	.719	.822	.602	.660	.849	.711
		(76)	(69)	(74)	(69)	(64)	(65)	(70)	(72)	(59)	(71)	(72)	(62)
Breast Stage III	...	...	.780	.755	.742	.664	.670	.673	.824	.595	.664	.847	.675
			(84)	(86)	(84)	(78)	(80)	(73)	(88)	(72)	(82)	(87)	(74)
Breast Stage IV	...	...	...	.648	.694	.642	.577	.658	.725	.598	.642	.754	.663
				(80)	(83)	(79)	(84)	(66)	(87)	(75)	(80)	(85)	(77)
Hair Stage II	...	...	...	...	.885	.823	.747	.688	.812	.660	.650	.798	.706
					(83)	(77)	(77)	(72)	(84)	(68)	(79)	(85)	(70)
Hair Stage III	...	...	...	...	...	.909	.688	.660	.813	.713	.711	.810	.684
						(81)	(80)	(69)	(86)	(72)	(81)	(84)	(73)
Hair Stage IV	...	...	...	...	...	...	.640	.615	.734	.614	.602	.696	.617
							(79)	(64)	(82)	(72)	(80)	(81)	(72)
Age Max. Growth	...	...	...	...	...	...	...	.686	.805	.594	.639	.837	.724
								(66)	(86)	(73)	(80)	(82)	(74)
Skel. Age 9.75	...	...	...	...	...	...	...	...	.781	.669	.747	.745	.728
									(73)	(57)	(69)	(70)	(59)
Skel. Age 12.75	...	...	...	...	...	...	...	...	...	.769	.793	.931	.785
										(76)	(84)	(88)	(77)
Skel. Age 16.25	...	...	...	...	...	...	...	...	...	...	.705	.736	.643
											(82)	(75)	(71)
80% Mat. Height	...	...	...	...	...	...	...	...	...	...	...	.856	.745
												(86)	(72)
90% Mat. Height	...	...	...	...	...	...	...	...	...	...	...	...	.851
													(77)
99% Mat. Height	...	...	...	...	...	...	...	...	...	...	...	...	...

from zero, provided the formula $r = (1 - r^2)/N$ is applied, a procedure suggested by Thompson (18, p. 156). It has been pointed out in other contexts, however, that this formula is an approximation which is misleading when the number of cases is small and the population value of the correlation coefficient is large (9, p. 123), conditions which seem to apply here. When the residuals in Table 12 are transformed into *z*'s, none is signifi-

TABLE 12

RESIDUALS FROM GIRLS' MATRIX

	B-II	B-III	B-IV	H-II	H-III	H-IV	MGA	9.75	12.75	16.25	80%	90%	99%
Men.	.006	.017	.032	−.006	−.030	.013	.011	−.053	.034	−.061	−.011	.039	.008
B-II	...	.180	.059	−.006	−.122	−.111	.086	.017	−.002	−.056	−.050	.013	−.012
B-III	...	...	.089	−.006	−.018	−.025	−.044	−.032	−.003	−.066	−.049	.008	−.050
B-IV	...	...	...	−.050	−.003	.010	−.078	.011	−.034	−.008	−.012	−.015	−.002
H-II	...	...	...	...	.117	.127	.026	−.024	−.024	−.008	−.070	−.050	−.027
H-III	...	...	...	...	...	.213	−.033	−.052	−.022	.046	−.009	−.037	−.049
H-IV	...	...	...	...	...	...	−.013	−.030	−.023	.009	−.050	−.072	−.047
AMG	...	...	...	...	...	...	...	.018	.020	−.033	−.037	.041	.036
9.75	...	...	...	...	...	...	...	...	.006	.050	.080	−.041	.049
12.75	...	...	...	...	...	...	...	...	...	.043	.010	.009	−.012
16.25	...	...	...	...	...	...	...	...	...	...	.079	−.001	.006
80%	...	...	...	...	...	...	...	...	...	...	...	.062	.058
90%	...	...	...	...	...	...	...	...	...	...	...	...	.043
99%	...	...	...	...	...	...	...	...	...	...	...	...	...

cantly different from zero at the 1 per cent level.[14] This, however, does not exclude the possibility that more than one factor is operating, since the same residuals might have appeared if a larger number of persons were used and thereby become significant. It did indicate that taking out further factors risked factoring chance variation. In this connection, also, the variation in the size of the group should be remembered.

The factor loadings and communalities are given in Table 13. Each communality may, by suitably changing the decimal point, be read as the percentage of the total variance of the index associated with the growth factor. It will be seen that this factor accounts for well over half of the variance of each index.

[14] This is a stringent criterion. Actually, at a later date we extracted two additional factors and rotated the loadings orthogonally until the negative loadings disappeared. The new factors measured primarily pubic hair development and breast development in addition to a general factor. The amount of variance associated with the general factor is reduced, to be sure, but not eliminated in any variable by rotation. It would seem that "simple structure" does not apply to this matrix, hence it is desirable to have the general factor account for as much variance as possible. For this reason, in addition to the question of significance, we used the results of the Spearman analysis.

TABLE 13

GIRLS' FACTOR LOADINGS

Index	*Factor Loading**	*Communality†*
Menarche	.850	.722
Breast Stage II	.864	.746
Breast Stage III	.868	.753
Breast Stage IV	.796	.634
Hair Stage II	.877	.769
Hair Stage III	.876	.767
Hair Stage IV	.794	.630
Age at Maximum Growth	.823	.677
Skeletal Age 9.75	.812	.659
Skeletal Age 12.75	.954	.910
Skeletal Age 16.25	.762	.581
80 Per Cent of Mature Height	.822	.676
90 Per Cent of Mature Height	.967	.935
99 Per Cent of Mature Height	.836	.699

* Correlation between index and general factor.

† Proportion of variance in index associated with general factor.

From the results of the factorial analysis, it is possible to evaluate the approximate efficiency of the indices as measures of adolescent maturation, the criterion for this evaluation being based on the interrelationships between the indices themselves.

In the girls' matrix there were measures drawing on five areas of development: Menarche, Pubic Hair, Breast, Skeleton, and Stature. Within each of these areas there are measures with high loadings, no one area having a monopoly in this respect. Ninety Per Cent of Mature Height has the highest loading, followed in descending order by Skeletal Age 12.75, Hair Stages II and III, Breast Stages III and II, and Age at Menarche. From consideration of the results in Table 13, it appears that 90 Per Cent of Mature Height is the best single measure of adolescent maturation of girls, with Skeletal Age 12.75 not far behind. Several of the other indices, however, are almost as good. Hair Stages II and III, and Breast Stages II and III, for example, have as high loadings as measures which have more commonly been used as indices, e.g., Age at Maximum Growth and Menarche. These latter, however, have high loadings, and if they were used in connection with the extremes of distributions, as seems to be the typical practice, the results would be quite similar to those obtaining with the slightly more efficient indices. When longitudinal data over a fairly wide temporal span are not available and the use of Age at Maximum Growth or Per Cent of Mature Height indices thereby ruled out, Hair, Breast, or Skeletal indices appear to be satisfactory substitutes.

Boys' Matrix

This matrix consisted of the intercorrelations between 11 indices previously described in Section I:

Age at Reaching Sex II —Increase in size of penis and testes
Age at Reaching Sex III—Straight, pigmented pubic hair
Age at Reaching Sex IV—Pubic hair adult in appearance but not in area
Age at Reaching Sex V —Genitalia adult in size and shape, pubic hair adult
Age at Maximum Growth
Age at Reaching Skeletal Age 11.25
Age at Reaching Skeletal Age 14.75
Age at Reaching Skeletal Age 17.25
Age at Reaching 80 Per Cent Mature Height
Age at Reaching 90 Per Cent Mature Height
Age at Reaching 99 Per Cent Mature Height

TABLE 14

BOYS' MATRIX

(Number of cases for each coefficient shown in parentheses)

	Sex-III *r*	Sex-IV *r*	Sex-V *r*	MGA *r*	11.25 *r*	14.75 *r*	17.25 *r*	80% *r*	90% *r*	99% *r*
Sex Stage II	.799 (89)	.788 (88)	.599 (77)	.665 (85)	.349 (88)	.689 (85)	.650 (58)	.380 (89)	.728 (87)	.644 (59)
Sex Stage III	...	.944 (89)	.762 (78)	.769 (86)	.455 (87)	.800 (85)	.799 (59)	.485 (88)	.802 (88)	.736 (60)
Sex Stage IV	...	...	.821 (79)	.814 (86)	.412 (87)	.685 (78)	.839 (60)	.533 (88)	.872 (89)	.771 (60)
Sex Stage V	...	...	...	.705 (78)	.342 (78)	.693 (78)	.735 (55)	.507 (79)	.739 (79)	.752 (57)
Age at Max. Growth .	...	...	...	...	.308 (83)	.834 (84)	.832 (57)	.620 (84)	.903 (85)	.819 (59)
Skeletal Age 11.25 ..	...	...	...	...	...	.515 (83)	.372 (58)	.605 (89)	.471 (86)	.267 (58)
Skeletal Age 14.75 ..	...	...	...	...	...	...	.928 (59)	.722 (85)	.951 (85)	.869 (59)
Skeletal Age 17.25 ..	...	...	...	...	...	...	...	.769 (59)	.942 (60)	.900 (56)
80% Mat. Height ..	...	...	...	...	...	...	...	...	.768 (88)	.711 (59)
90% Mat. Height ..	...	...	...	...	...	...	...	...	...	.927 (60)
99% Mat. Height ..	...	...	...	...	...	...	...	...	...	...

TABLE 15

RESIDUALS FROM BOYS' MATRIX

	Sex-III	Sex-IV	Sex-V	MGA	11.25	14.75	17.25	80%	90%	99%
Sex Stage II	.136	.112	.005	.010	−.003	−.008	−.055	−.160	−.012	−.023
Sex Stage III	...	.140	.056	−.009	.037	−.029	−.039	−.156	−.078	−.057
Sex Stage IV	...	...	.101	.021	−.014	−.160	−.016	−.121	−.025	−.038
Sex Stage V	...	...	...	.008	−.032	−.049	−.015	−.067	−.049	.042
Age at Max. Growth	...	...	...	...	−.105	.016	.004	−.013	.034	.036
Skeletal Age 11.25	...	...	...	...	...	.075	−.073	.265	.004	−.154
Skeletal Age 14.75	...	...	...	...	...	...	.047	.048	.026	.035
Skeletal Age 17.25	...	...	...	...	...	...	...	.087	.006	.057
80% Mat. Height	...	...	...	...	...	...	...	...	.052	.066
90% Mat. Height	...	...	...	...	...	...	...	...	...	.041
99% Mat. Height	...	...	...	...	...	...	...	...	...	...

It included indices presumably preceding and following adolescence, i.e., Skeletal Age 11.25 and 99 Per Cent Mature Height. A boy's "score" was the chronological age of reaching each stage. As was the case with the girls, the coefficients were not based on the same number of cases in each instance, and curtailment due to the elimination of late maturers may have lowered the correlations with 99 Per Cent Mature Height, Skeletal Age 17.25 and Sex V. (See Section III.)

Table 14 shows the intercorrelations among boys' indices. The table was factored by the same method used for the girls'. The residuals after the first factor was extracted are shown in Table 15. None is significant at the 1 per cent level using the z-test. On this basis, therefore, no further factors were extracted, but the remarks made in connection with the girls' matrix apply here, i.e., significant residuals leading to additional factors might appear if the group were larger. The factor loadings of each measure are given in Table 16. The communalities of most of these tests are high and quite comparable with those obtained for the girls. Three measures, however, have relatively low communalities: Sex II, Skeletal Age 11.25, and 80 Per Cent of Mature Height. It will be seen that these represent the chronologically earliest ages in the matrix. The residual between 80 Per Cent and Skeletal Age 11.25 comes closest to the 1 per cent level of significance, suggesting a possible group factor in these two tests.[15]

[15] When these two variables are eliminated from the matrix and the analysis repeated, the two largest residuals are .151 and .113.

TABLE 16

BOYS' FACTOR LOADINGS

Index	*Factor Loading**	*Communality†*
Sex Stage II	.747	.558
Sex Stage III	.888	.789
Sex Stage IV	.905	.819
Sex Stage V	.795	.632
Age at Maximum Growth	.877	.769
Skeletal Age 11.25	.471	.222
Skeletal Age 14.75	.934	.872
Skeletal Age 17.25	.944	.891
80 Per Cent of Mature Height	.722	.521
90 Per Cent of Mature Height	.991	.982
99 Per Cent of Mature Height	.894	.799

* Correlation of index with general factor.

† Proportion of variance in index associated with general factor.

As was true for girls, all of the variables have substantial loadings on a general factor of adolescent growth. This result is not surprising, since the indices selected have been held by others to be strongly influenced by endocrine changes associated with adolescence. Not all of the measures, however, were equally affected by this factor. The boys' matrix had measures from three developmental areas: Sexual Characteristics, Stature, and Skeleton. Each area had indices with high loadings, a further indication of the generality of adolescent growth. The fact that the chronologically earliest measures in each area, i.e., Sex II, 80 Per Cent of Mature Height, and Skeletal Age 11.25, have the lowest loadings may indicate that these indices occur before the endocrine effects are at a maximum. The highest factor loadings occur in measures taken around the age of 14; 90 Per Cent of Mature Height, for example, has a factor loading of .99.

Derivation of Maturity Scores

With the completion of our first two tasks, namely, the determination of the degree of generality in adolescent growth and the assessment of relative efficiencies of the various single measures of maturation, the third objective, the derivation of an over-all "maturity score" for individuals was possible. To obtain a summary figure representing the rate of physiological maturing during the adolescent period, multiple regression equations were used. The general factor became the criterion variable which was to be predicted from a knowledge of its correlations with (loadings in) the maturity indices. The multiple regression equations gave the best

weights to be used for tests in combinations which were to predict the criterion, and the multiple correlations between these combinations and the general factor indicated how well each combination performed. The Doolittle (9, p. 157) method was followed to obtain the weights. It was necessary to use only three tests to obtain very high correlations with the criterion.

Girls' scores. Most of the girls' maturity scores were based on a weighted combination of Skeletal Age 12.75, 90 Per Cent of Mature Height, and Hair II. The multiple correlation of this combination with the maturity factor is .99. When one or more of these particular indices were not available for a given girl, a regression equation utilizing other indices was computed and weights found for these new tests. The correlations between these various combinations and maturity range from .90 to .98. The scores from the use of each of these multiple regression equations were obtained in standard score form. They represent an estimate of adolescent physiological maturity embodied in a single score. In 101 girls, the Adolescent Maturity Score has a range from 22 to 70 with a mean at 50 and a standard deviation of 10.

Boys' Scores. Since the correlation between 90 Per Cent of Mature Height of boys and the maturity factor was .99, standard scores on the former were used as the Adolescent Maturity Scores for this group. In the few instances where no 90 Per Cent of Mature Height determination was available, multiple regression equations were used in the same manner as with the girls. The multiple correlations between these combinations and the maturity factor varied from .95 to .99. The Adolescent Maturity Scores of the 92 boys range from 27 to 71 with a mean at 50 and a standard deviation of 10.

III. Evaluation of Results

The maturity scores make possible an evaluation of the effect of curtailment on the maturity dimension of the samples used in norming the girls' terminal indices. The mean Maturity Scores were computed for girls included in and excluded from our Skeletal Age 16.25 and 99 Per Cent of Mature Height groups. On both measures the means of the omitted group were lower (later maturing), but the differences were not significant at the 5 per cent level. These results indicate that there was no significant loss of late-maturing girls because of the termination of routine data collection at 18. Confirmation is found in the fact that the mean chronological age for Skeletal Age 16.25 is 16.28. Such close agreement would not be expected if late-maturing girls had been eliminated from the sample, unless, of course, Berkeley girls mature later than Todd's sample. Somewhat different results were found in this connection with the boys.

The boys' Maturity Scores were similarly used to study the possible curtailment of the later indices. The means of the cases omitted from two

of the terminal measures, i.e., Skeletal Age 17.25 and 99 Per Cent of Mature Height, were lower (later maturing) than those from the norming samples for these measures,[16] and these differences were statistically significant at the 1 per cent level. This clearly indicates that the norms for these indices are biased because of the elimination of late-maturing boys from the sample, a fact to be kept in mind when utilizing these findings for comparative purposes.[17] This bias also affected the factor loadings to some extent, since it may have resulted in the attenuation of the correlations involving these two variables, i.e., higher correlations would be found if the full sample had been used. The factorial results for boys, therefore, seem less reliable than those for girls.

TABLE 17

CORRELATIONS BETWEEN MATURITY SCORES AND PRE-PUBESCENT MEASURES

Pre-Pubescent Variable	Girls		Boys	
	N	*r*	*N*	*r*
50 Per Cent of Mature Height	74	.48	64	.24
55 Per Cent of Mature Height	71	.54	81	.36
65 Per Cent of Mature Height	89	.64	85	.58

The variables in the correlation matrices covered the period of adolescence, but the possibility remained that measures taken prior to pubescence would correlate significantly with the Maturity Score. Unfortunately, indices were available in only a single developmental area (other than age of walking) earlier than the ninth year: *Per Cent of Mature Height.* Three of the earlier Per Cents of Mature Height were correlated with the Maturity Scores of boys and girls to determine whether individual differences in early growth were related to those characteristic of adolescence. These correlations appear in Table 17, all but one being significant at the 1 per cent level, the exception (50 Per Cent of Mature Height, boys) at the 5 per cent level. Individual differences at early ages, it appears, are significantly related to adolescent maturation. The extent of these relationships, however, ranges from moderate to small. The correlations for girls are higher at each Per Cent of Mature Height level, a fact which tends to support the belief that the results from the girls' matrix are more reliable than those from the boys'.

[16] Sex V was not affected by curtailment.

[17] The difference between the chronological age at which our boys reach Skeletal Age 17.25 and the Todd standard is in keeping with this finding. (See Figure 6.)

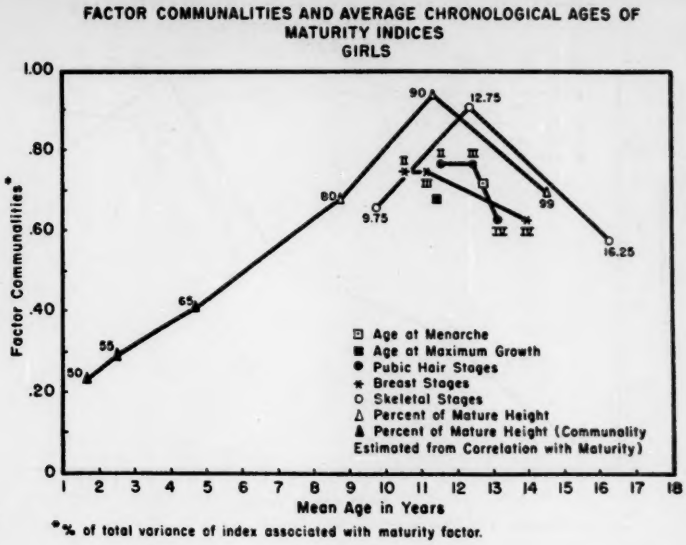

FIGURE 12

The factor communalities, i.e., squared factor loadings, of each variable in the matrices are shown graphically in Figures 12 and 13. The communalities for the early Per Cents of Mature Height were arrived at by using their correlations with Maturity Score as estimates of their factor loadings. Measures in a single developmental area are linked together in these figures. The highest communalities occur among the girls' measures taken between the 11th and 13th year; in boys, the high points of the curves center around year 14. There is a pronounced tendency for the communalities to become lower as they become temporally more remote from these centering points. This, of course, is a function of the selection of measures in these matrices. Measures taken at a given age level in different developmental areas tend to have factor communalities of approximately the same size. This, it woud seem, is a clear indication that earliness or lateness on a given measure at a particular age level during adolescence is a function of the general maturational status at the time.

Useful predictions of individual adolescent maturation could not, of course, be made from the early Per Cents of Mature Height. The correlations are too low, and Per Cent of Mature Height cannot be calculated until terminal height is reached. Prepubescent skeletal age, however, might provide a useful prediction, but X-rays were not taken before eight years.

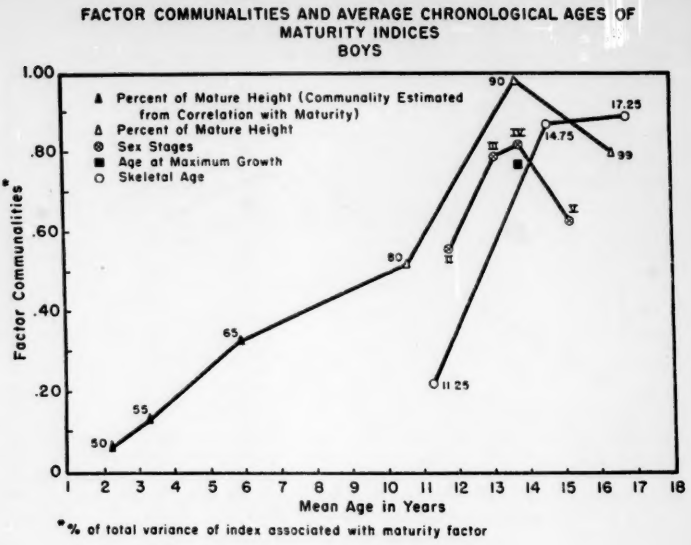

FIGURE 13

The shape of the Skeletal Age curve in Figure 12 is very similar to that for the Per Cent of Mature Height measures. In Figure 13, however, Skeletal Age 11.25 has a factor communality much lower than other measures taken at nearby ages. It is difficult to determine the reason for this discrepancy, since reliability figures for this particular datum are not available. Skeletal Age 17.25 in Figure 13 has a higher communality than would be expected on the basis of the results in Figure 12 or from the other curves on Figure 13, which show the terminal stages to have lower communalities than earlier stages in a given area. It is possible that Skeletal Age has a different relationship to adolescent development in boys than in girls, but the data from the factorial analysis in this study are not suitable for settling this problem, since the terminal boys' measures were curtailed on the maturational dimension.

SUMMARY

1. Various measures of physiological maturity and their rationale are described. Data are reported for a representative, urban sample of approximately 180 boys and girls who were measured annually from their first to their eighth year of life and semi-annually thereafter until they were 18 years of age.

2. Age norms for girls are presented with respect to the following objective indices: age of walking, three stages of pubic hair growth, three stages of breast development, age at maximum growth, age at menarche, three stages of skeletal growth, every fifth per cent of mature height from 45 to 99 per cent, inclusive. The findings show that breast development of girls begins on the average at 10.6 years and reaches the adult stage on the average at 13.9 years. The average age at which pigmented pubic hair first appears in girls is 11.6 years; while the age at reaching the adult stage of pubic hair development was not reliably determined (average r between three judges was .61), but it was later than 13.2 years. The average age at menarche for this Berkeley sample is 12.8 years.

For boys, the norms cover the age of walking, four stages of primary and secondary sexual characteristics, age at maximum growth, three stages of skeletal development, every fifth per cent of mature height from 45 to 99 per cent, inclusive. The average age of the boys when the first signs of sexual changes appeared is 11.8 years and the average age of reaching the mature stage is 15.2 years. The average age of maximum growth for boys is 13.8 years as compared with an average age of 11.5 for girls.

3. To determine the degree of generality in adolescent growth, a factorial analysis (using Spearman's method) of the intercorrelations of these indices (excluding age of walking) was made. This analysis yields a general factor with high loadings in each index. With the exception of one index for boys (Skeletal Age 11.25), the factor accounts for well over half of the variance of each index, thus showing the high degree of relationship between measures as phenomenally different as pubic hair development and closure of certain epiphyses.

4. For both sexes, it appears that the age at reaching 90 Per Cent of Mature Height is the best single measure of physiological maturity. For girls, the least adequate is Skeletal Age 16.25; for boys, Skeletal Age 11.25. The results indicate that when longitudinal data collected over a fairly wide temporal span are not available and the use of Per Cent of Mature Height indices thereby ruled out, measures of sexual or skeletal stages are satisfactory substitutes.

5. With the exception of the variable 90 Per Cent of Mature Height for boys, the combining of several indices in multiple regression equations results in better estimates of factor scores for each child, the multiple correlation coefficients ranging from .90 through .99.

6. A Maturity Score in standard score form which measured over-all adolescent physiological maturation is derived for each individual. This score (spreading over 4.5 standard deviations) represents the best possible estimate, for the indices used, of the standing of an individual relative to others in regard to the chronology of maturation. Covering a wide range of maturity scores, it offers statistical advantages not available in dichotomous early-late categories.

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ADULT DISCOUNT: AN ASPECT OF CHILDREN'S CHANGING TASTE

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I

During the course of a larger research (7) that was designed to explore the adequacy of postulating five factors—content, medium, personality, the immediate setting of contact, and the social definitions of content, medium and medium activity itself—to determine the responses of an audience of children[1] to mass communications, we had occasion to run head-on into trying to account for the fact that as children grow older their tastes for dramatic material change. In the course of trying to explain this, we found in the notion of adult discount an unhappily neglected but happily appropriate means of beginning to grapple with the problem.

In this paper we wish to present some of our data on children's changing tastes and by using the notion of adult discount try to make them intelligible. We will first describe the changes in taste that were observed, along with relevant interview material, then present the concept of adult discount and demonstrate how the children's reactions are made intelligible by its use.

II

By means of interviewing we determined what sorts of drama the children liked best. We found that the largest percentage of kindergarten children preferred westerns and the humorous stories that have animal or puppet characters (cartoons or otherwise). Second grade children tended to prefer westerns; fourth grade children tended to prefer comedy and adventure (stories without the recurrently same locale and without continual recurrence of the same hero); and the sixth grade children tended to prefer comedy, adventure, and horror (or spooky) stories. These findings are in accord with past studies of the taste of children (9; 10; 14, pp. 51-72).

The problem lies in explaining why the children's tastes change as they grow older. The pattern of changing taste is associated most closely with

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[1] The audience of children consisted of 79 lower class public school boys whose ages ranged from 5½ to 13½ years, approximately 20 from each of 4 school grades—kindergarten, second, fourth and sixth.

It is unfortunate that in order to protect the anonymity of the children I cannot name the principal, officials and teachers who made me welcome at the school where I interviewed the children. I can only express my debt and gratitude in this obscure way.

age; sex, social class, and even British or American nationality do not seem to be so crucial (5, pp. 332-339; 6; 9; 10). This suggests that some factor implied by age and unlimited by the *specific* implications of sex, social class, and British or American nationality is the key to the explanation.

One thinks first of all that emotional needs must be that key factor (8). Many writers have claimed that emotional needs are what is primary in responding to drama, thereby implying that taste would be determined by such needs, and some evidence exists that in some cases taste is closely connected with emotional needs (1, 2). But to our knowledge no investigator has been able to establish reliable statistical associations between emotional needs and taste in the case of either adults or children. We, too, were unable to find such associations (7). It appears that the same drama can be perceived differently by different individuals so that those with different emotional needs can have the same tastes or those with similar emotional needs have different tastes.

In the face of that we turn to the usually overlooked cognitive aspects of child development—the active accumulation of experience and expansion of social intelligence that go with increasing age (13). Perhaps these aspects, rather than the emotional, can be more satisfactorily connected with taste. In order to investigate them we must find out what the child knows about the dramatic material he sees, hears, or reads, and how he uses that material; this involves listening closely to the children's verbalizations about their tastes and probing as long as the results are enlightening. We probed, in fact, not only the children's reasons why they liked what they did, but also why they disliked what they did. This last proved to yield rich material.

The point of departure for criticizing what they have rejected lies in the epithet "babyish." What the older child dislikes, babies like. A sixth grader, for instance, said that he liked cartoons, and friend interrupted with an exhortation not to be a baby. A second grader complained that he only had animal comics—baby comics—to read. The older children apologize for watching something like Captain Video by saying, "I have to watch that—my little brother puts it on."[2] They emphasize their sophistication by pointing the finger of scorn at "the little kids [who] get excited and jump up and down like that" when they see babyish drama. What the older children do not like is liked by younger children. What excites younger children fails to excite them.

The older children do not find the pictures they dislike to be *convincing*. '[The cowboy] comes and everyone falls dead—one shot." One boy asked his friends, "What's that picture we saw where all the guys are missing—all the guys are on top of each other and they're missing each other?" Another said, "They never run outta bullets." Captain Video is "goofy be-

[2] Unless otherwise noted, all quotations are literal transcriptions from wire recordings made of the interviews. The interviews took place during the first five months of 1951. All children's names are fictitious.

cause when they crash no one gets killed—they all walk out." "They never die, they never get killed."

Not only are such rejected dramas unconvincing because they are frequently implausible, but because they are cut out of a pattern that has become obvious and all too *predictable*. A longer interview passage will give us a clear picture of this in conjunction with other objections.

WILLIAM: Well, what I don't care about—I don't like cowboy pictures so much.

INTERVIEWER: Why not?

WILLIAM: You see the guys running for the crook, they jump on the crook, and you always see them rolling down the hill.

NORTON: Yeah.

WILLIAM: Never flat.

NORTON: They never fell flat.

WILLIAM: They jump off the horse like they're made of steel and pom, they land on the [crook].

NORTON: Or else the horse is standing over there and the guy's about on a two-story building so he—the guy jumps off right onto the horse and he's riding away.

CHARLIE: Yeah.

INTERVIEWER: I'd hate to be the horse.

CHARLIE: Yeah.

NORTON: Or like one guy rides into the town and about fifteen other guys are waiting for him. He rides right through the town—bang, bangbang, bang, bang, bangbangbang, and he's riding outta the town. Every other guy is dead (*he laughs*).

CHARLIE: Yeah, and they never ran outta bullets, either.

NORTON: No.

WILLIAM: Bough, bough, bough, bough. (*imitating gun shots*)

NORTON: The six-shooter. For a sixshooter they sure carry lots of ammunition.

CHARLIE: Fifteen, sixteen, bough, bough, seventeen (*laughs*) and they're still shooting. Then one time the guy shot two bullets—outta the gun.. it was empty. Then he pulls out another one and keeps shooting the thing. About ah, there was about ten guys and along they came and the guy shoots out his gun, takes out his other one, and babababaha, everybody's dead . . . .

NORTON: I mean, like, that's impossible, if a man is supposed to fight against so many others and he comes out alive all the time. . . .

CHARLIE: But in a cowboy picture, in a cowboy picture, there they go. The picture starts—wham, one guy goes, about fifteen other guys. Here comes the posse, bang, bang, bang, they're all dead. They go into town. There's an ambush ready for them. Bang, bang, bang, they're all dead too. He goes into the next town, sneaks in. One guy notices him. There, he gets caught. All right, that's all. Bang, bang, bang, they get him outta jail. Bang, bang, bang, they're all dead again. That's all that goes through the picture, just horses and shooting.

INTERVIEWER: Well, it's a story isn't it, I mean—

NORTON: It's exciting and all that, but it gets boring. . . . Nowadays, pictures aren't—I think they're fading away.

III

By calling what they do not like "babyish," the older children are stating the fact that what they do not like is liked by younger children and expressing an attitude of derision all at once. It is only when we go beyond the merely general and pejorative term that we begin to get at the basis for the children's taste. We have seen that they reject particular types of stories because (*a*) while they might be exciting to "babies," they are not exciting to older children, (*b*) the stories are implausible and unconvincing because they are unrealistic, and (*c*) the stories are boring because they are too easily predictable. Much might be made out of this *ad hoc,* but we are fortunate in having two independent researches through which we may clarify the problem, and the concept of adult discount in terms of which we may order the material. Before going deeper into our material, then, we turn to those previous researches and the notion of adult discount.

In their study of the emotional responses of children to moving pictures, Dysinger and Ruckmick (4) found that as the age of their subjects increased, their psychogalvanic and pneumocardiographic responses to movies tended to decrease. In other words, the older the child, the less was he actually excited by the movies. The condition of not being as excited as young children was termed "adult discount." The connotations of the term are such as to fill in the rest of the definition.

This "adult discount" appears to be connected first of all with the ability to predict what will happen next in a story. Dysinger and Ruckmick noted that upon repeated exposure to the *same* movie, their subjects' responses decreased markedly, no matter what the age. This implies that the subjects had learned what would happen next during the repeated showings and consequently did not respond so intensely. The authors in fact noted that where the anticipation of a fearful event is *predictive* in nature, the intensity of emotional response decreases. In order to arrive at "adult discount," then, children must learn to be able, in some sense, to anticipate what will happen next in a drama.

Using similar methods of recording circulatory, respiratory, and electrodermal changes, plus direct observation, DeBoer (3) studied the emotional responses of children to radio drama. He found, like Dysinger and Ruckmick, that younger children responded more frequently than older children. He noted that the younger children seemed to react to each separate incident of the story rather than to exhibit any steady rise or fall of interest over any large section of the plot; they reacted in a succession of shock-like responses. Adolescent children, on the other hand, exhibited in addition to responses to individual incidents a clear sense of the continuity of the story, for they demonstrated a steady rise of responses over the later phases of the plot as a whole. "This consciousness of the larger plot patterns was reflected also in the vigorous response noted in the case of surprise endings, which

presupposes a powerful interest in the relationships which gave the surprise endings significance" (3, p. 109).

We may venture to conclude from this that part of the growing ability to predict seems to lie in the growth of the child's command over the total plot of the drama, for without a sense of something more than discrete incidents, prediction is impossible. Part of the growth of this command seems to lie in repeated experience with the same type of drama as well as repeated experience with the same drama.

There is another aspect, however, that also seems tied in with the strong responses of young children and the weak responses of older children. DeBoer noticed that younger children seemed to react to dramatic events as if they were real, while the "older children, particularly those in the age group from 12 to 14, tend to objectify the narrative to which they are listening and to regard it as entertainment rather than a series of incidents directly affecting themselves" (3, p. 106). The older children seem more *detached* from the dramatic experience than the younger.

This detached attitude toward drama has been dealt with by estheticians under such terms as "psychical distance," and "detachment." John Hospers (11), for example, considers it to be the minimum attribute of the esthetic attitude. "This fundamental attitude consists in the separation of the esthetic experience from the needs and desires of everyday life and from the responses which we customarily make to our environment as practical human beings. . . . The esthetic attitude can occur only when [the] practical response to our environment is held in suspension" (11, p. 4). We may venture to point out that separating experience with drama from experience in daily life involves making distinctions about *reality*. In order to be detached from experience with drama, one must not consider it to be as real as, or the same kind of reality as, that of practical, everyday experience.

We may say, then, that in order to be said to "possess" adult discount, an individual must develop at least (*a*) the ability to view a plot as a unified whole so that prediction or anticipation is possible, and (*b*) a distinction between the reality of practical experience and the reality of experience with drama such that a modicum of detachment from dramatic experience is possible. Adult discount involves a certain tempering of response to drama, a certain suspension of complete involvement.

IV

The older children have claimed that their tastes have changed because what once excited them and what still excites younger children is no longer sufficiently exciting to be pleasurable. In this sense, change of taste involves decrease in emotional response to a particular type of experience. The reasons they give for this suggest that this decrease in pleasurable excitement is caused by their developing ability to predict too easily what will

happen next in the "babyish" stories, and by their feeling that the action in those stories is too unrealistic to be plausible. In our analysis of adult discount, we suggested that the ability to predict presupposes an ability to treat of a plot as a coherent whole. We may note now that questions of the plausibility of a story can arise only when one has become sufficiently detached from experiencing the story to stand outside it and judge it *as* a story. As we have already suggested, this detachment in turn presupposes a distinction between dramatic experience and practical experience, dramatic and "real" reality. If this is correct, we should expect to find paralleling change in taste a development of the children's conception of plot and a concomitant development of the distinction between dramatic reality and experiential reality. Such a development was, in fact, observed, and will be described in the following pages.

From the second grade on, we find the children continually using the term "action" in conjunction with media drama. A story is good if it has action and bad if it has none. Whether the story has action or not is one of the basic critical criteria of excellence. But we find that action means different things for each of the age-groups. To trace the changing meaning of that term is, in fact, to trace the development of their ability to encompass a plot as a unified whole.

For the younger children the total plot is weighed only to the extent that it contains incidents that actually elicit emotional response. "Action" consists in such incidents. If there is only one exciting incident in a plot, that incident is all that represents the experience of the whole plot. In this sense, the younger children seem to be impressed more by isolated actions within the plot than by the plot as a whole.

> Hey, did you see that Gene Autry, when they was riding along and one says to the other, "This looks like a nice peaceful place, let's camp here," and he was going to get some water when whizz, an arrow went right through his hat!

These events stand out because they elicit excitement from the children. Since the intervening events do not elicit excitement, they seem to be just about lost to the children. Hence the children's view of the plot as a whole is vague and impressionistic, at its most coherent a patchwork of discrete events that are exciting.

> Hey, did you see that one with the leopard, when he jumped on him and killed him?

The story is experienced as a number of isolated instances of excitement not necessarily joined into any whole. A story is full of action if it has a large number of such instances.

In the fourth grade the children are looking for new twists, new kinds of chases, new types of dangers. They begin to look for more complicated combinations of events that meaningfully encompass the plot rather than

discrete events that exist as sharply defined parts of a vague whole. The whole plot becomes one great event in which temporal sustention can itself become a value.

> I like Charlie Chan because he's the hardest one to solve mysteries—it takes about three weeks to solve them.

It is in the fourth grade that we first find spontaneous mention of the type of drama we call funny-spooky—deliberately sustained blendings of the broadly comic and the terrifying like Abbott and Costello Meet Frankenstein. Comic relief is present in more "babyish" cowboy stories of course—some of the younger children in fact are attracted to a cowboy series not because of the hero but because of the comic foil who always accompanies him—but in the fourth grade the conception of plot as a totality has become so clear that instead of liking something for its isolated funny or exciting episodes, the various episodes are contrasted to each other as part of a whole. Consequently, these older children are able to talk about "putting comedy in the murder pictures," about a total plot in which horror is purged by laughter.

In the sixth grade we find a still greater emphasis on the plot as a whole. As we might expect, more of the children make spontaneously appreciative reference to the funny-spooky type. They seem to be more conscious of a story as a sustained whole, not only as a sustained whole lasting over a certain period of dramatic and natural time, but as a structural unity as well. They have become sophisticated enough to be able to predict what will happen in the highly stylized cowboy stories and seem to be extending this sophistication into other fields. One boy said he preferred watching television with his father because his father tells him "more about them—what's gonna happen next." After some debate the others agreed that sometimes they would like to know what will happen next. This matter of prediction becomes important.

This matter of prediction puts the children in a peculiar quandary. On the one hand we take it to be axiomatic that what they seek in their drama are thrills—catharsis, purgation, what you will. But on the other hand, whether by virtue of their expanding intelligence and growing control over their experience or their cultural milieu or something else, they also place a premium on being able to predict or anticipate the events of a story. Their ability to predict, however, decreases the thrills they can obtain and disqualifies more and more types of drama from being thrilling. Where younger, less sophisticated children still find infinite diversion in media drama, the older children complain of being "tired of too much of the same thing."

Sky King is decried as "kids' stuff. You can guess right away. Like in that movie The Creeper you couldn't tell who it was." Sophistication grows, more action can be predicted and presumably less action is moving. So the

children tend to seek stories that are difficult to predict, or else stories that are so terrifying that predictive ability is petrified. One sixth grader said, "Spooky things, they got thrills in them. Mystery things, you just watch and see guys getting killed." The dangers of mere killing become monotonous and mechanical so that new thrills are sought in the extraordinary dangers of the supernatural or superhuman.

> One Million B.C. and, ah, Adventure Island, there was two good pictures about animals of long ago. . . . They're more exciting, because if you saw a big twenty-foot animal coming over you with big fangs over you you'd get more afraid than if a man came at you with a gun. You could protect yourself, but you shoot that thing, it'd just bounce off.

Such stories are liked because it is difficult to predict how one would overcome the danger.

We may conclude this discussion of "action" by presenting the most refined distinctions made in the sixth grade. In them is a shrewd grasp of plot and a keen conception of what makes a plot effective.

INTERVIEWER: What's action in a picture?

CHARLIE: Well, in a picture action is something fast. One person—before you know it he does what you least expected. Like in that Red River, it was exciting because it was all the way across the West, it was all tension until the end of the picture and then came the action and there was plenty of it—there's shooting, everybody was fighting each other.

Action is crude and physical, but there is an implicit critical criterion of action that places it in the context of a larger whole. The spectator is excited because everything *as a whole* moves quickly, tensely, expectantly, unpredictably towards the final explosion of energy. Action is no longer in the isolated event, but rather in the event's relationship to the whole. The same boy characterized the action in spooky pictures.

> During the spooky pictures there isn't much action. It's all slow like that —that's what gets you scared.

Action as physical action is almost lacking in the spooky. Here it is the attenuated pacing of the plot as a whole, dominated by the indefinable sense of threat that fascinates, terrifies, and pleases; the single exciting events are no longer necessary for excitement and pleasure.

V

There is one other term that the children use in discussing drama—"phony" or sometimes "fake" and "corny." They use those terms to indicate that the drama is contrived and implausible. When they use such a criterion for their criticism, they are assuming, first, that drama imitates or represents some reality and, second, they are assuming particular conceptions of what is or what can be real. Ghosts are real, but a six-gun that

shoots twelve times is phony. They are distinguishing between "real' reality and drama and judging drama by the extent to which it is true to "real" reality. We wish to point out here how that distinction between dramatic and experiential reality (and the attendant detachment from dramatic experience) develops over the grades, and how it is manifested in the children's reactions.

We have little material from the kindergarten children, primarily because they do not seem to use any criterion of reality in their discussions of mass media drama. Description of a story merges into private fantasy to such an extent that it is quite difficult to tell where the one ends and the other begins. And they have a tendency to act out the events as if they were actually experiencing them.

In the second grade we find most of the children accepting the stories if not as true events that directly affect them, then certainly not as "just" stories. One boy implied that Cactus Jim was "only" an actor by pointing out that his beard is false, and another was offended by the implication and willing to bet that the beard and Cactus Jim are real. The children seem mostly to be impressed by the likely impossibility (to use Aristotle's term) that the events they experience in drama are real, and their reactions are more intense, more proportionate to something that directly affects themselves than those of older children.

BARRY: I saw that picture about Flash Gordon. There was a gorilla that broke a nigger's neck.
ERNEST: It's just a picture. There's a man inside.
BARRY: But sometimes there might be a gorilla inside.

Though they might already be beginning to be aware of the convention of drama in merely *representing* reality, the stories seem real enough for them to feel that they might be real anyway. The "real" reality of the story is a likely impossibility.

By the fourth grade the children have made the distinction between dramatic reality and real-life reality and begin to judge the excellence and plausibility of a story by its faithfulness to what they consider the real to be.

TIM: Like Captain Video, what a phoney.
MARK: Yeah, it's only a film.
TIM: No, it's a play.
MARK: Yeah, but you don't really see them going up to the moon, now, do you?

In the sixth grade there is merely a heightening of the same sense of critical detachment—drama is not "real" anymore, but since it is supposed to represent reality, it is judged in terms of its faithfulness.

LEO: Did you see [that picture about Cortez]? An arrow went through his head so they put a hot iron on it and pulled it out. And then he was shot in the heart and he still wasn't dead.
BOB: Yeah, they never die, they never get killed.

Enough of this kind of jaundiced, literalistic, and bloodthirsty criticism has already been presented to preclude the necessity of more.

VI

The notion of adult discount suggests why older children are no longer moved by what excites younger children. The ability to encompass a plot as a unified whole has developed so that they become able to predict what will happen next (which lowers emotional response); the realization that drama is not the same as experiential reality has developed so that the older children become more detached from their experience with drama (and this too tempers emotional response).

We may point out that among the children of this research the process of changing taste is more or less *independent* of specific adult influences. Cowboy dramas, for example, are eventually rejected whether parents make an active effort to encourage rejection or not. On the contrary, the main outlines of the process appear to involve the dynamic combination of social interaction with peers, accumulation of experience with drama, and the developing intelligence of the child himself. In this paper we have dealt only with the *products* of that combination—the child's developing sense of plot and detachment from dramatic reality—and have reserved for another paper the process by which the product emerges.

It may be suggested that the gamut of taste we have observed, from the most highly stylized and "unrealistic" cartoons and cowboy series to the more varied and more "realistic" adventure dramas, can be partially understood by reference to the content of the dramatic material itself. Cartoons and cowboy stories, with their ritualistic plots and fixed constellations of characters who have constant traits and behave always in the same way, seem to be among the types over which it is most easy to gain command, the types which are most attractive to the naive, inexperienced audience whether child or adult. The relatively unsocialized child would tend naturally to be attracted to such types rather than to others. Given our cultural milieu that emphasizes "realism" and through the peer group encourages the active questioning and skepticism typical of urbanism, given extensive experience with these types of content, the growth and active use of social intelligence tends to make for shifts in taste toward the "realistic," "authenticated," culturally-prized type of drama in which characters are more varied and have more or less human traits, and in which dramatic action is more complex and less highly ritualized. In keeping with the development of the child, it is a movement from the simple to the more complex as well as a movement from the childish to the more fully socialized. In another cultural milieu with different socialized standards (12), we should still find that *form* of movement, though the substance may be different.

Finally, we wish to emphasize the suggestion that the emotional gratification that may be obtained from dramatic material is limited by the

detached, critical attitude that adult discount involves. A sophisticated sixth grader, no matter what his emotional needs, will not be able to obtain the same degree of emotional stimulation from a typical cowboy story as a kindergarten child. In the same sense, adult discount seems to place definite stricture on the extent to which the spectator is able to use dramatic material as fantasy—to the extent that he adopts a critical and detached attitude in attending to drama, to that extent the spectator is not sufficiently involved in the drama to be able to use it as an emotionally charged fantasy and thereby obtain emotional release. Indeed, whenever we speculate about or investigate the effects or even the character of mass media experience, if we seek accuracy, these considerations must be taken into account.

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CHILD ANIMISM: WHAT THE CHILD MEANS BY "ALIVE" [1]

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INTRODUCTION

Piaget has been concerned with the nature and development of the child's thinking, of his conceptions of the world, and the reasons for qualitative differences at various ages. Among other characteristics of child thought, Piaget studied animism (5). By animism he means the attributing of life and consciousness to certain inanimate objects, but he qualified this meaning in various ways which seem not to be entirely consistent. These two aspects of animsim, "consciousness attributed to things," and "the concept of 'life'," are treated separately by Piaget. Whether or not a child attributes consciousness to an object is determined by asking him if the object can feel or is aware of various sorts of stimulation or activity, and why the child thinks so. Regarding the concept of life, the child is asked: "Is the ——— alive?" and "Why?" In each case the child is assigned to one of four stages of animism. The criteria for categorization are similar in each case, and essentially as follows:

The child who attributes consciousness and life to anything that is in any way active, undamaged, or useful is assigned to *Stage 1* for both consciousness and life. A whole dish is alive; a broken dish is not alive. The child in *Stage 2*, for both series, attributes consciousness and life to anything that moves. A ball is alive when it is rolling; otherwise it is not alive. For a child in *Stage 3* anything that moves of its own accord is conscious and alive. The sun and moon are alive; a bicycle is not alive, even when moving. The child in *Stage 4* restricts consciousness and life to animals alone, or to plants and animals. Humans and animals are alive, and many children in this stage state that plants are alive.

Piaget states: ". . . children who are in the first or second stage when speaking of consciousness are generally found to be in a more advanced stage for ideas concerning life. The elder children, on the contrary, that is to say, those in the third and fourth stages, are usually in the same stage in the

[1] This material was presented by the author to the Graduate School of the University of Pittsburgh in partial fulfillment of the requirements for the degree of Master of Science. The author is indebted to the following members of the faculty for their assistance and many helpful suggestions: Dr. David A. Lazovik, Dr. Jack Matthews, and Dr. Albert W. Bendig.

parallel series" (5, p. 205). Regarding children in the second stage of animism, Piaget states:

> The impression these children give is that the assimilation of life to movement is evidently simply a matter of words. That is to say, the word "life" means simply movement, but this movement has none of the characteristics with which we should define life, such as spontaneity, purpose, etc. . . .
>
> We think, however, the matter goes deeper, and that movement in general is really thought to possess the characteristics of life (5, pp. 200, 201).

Piaget does not make clear, however, what he means by "the characteristics of life."

More recently, investigators have employed questions aimed at determining the types of objects the child regards as alive as a measure of animism. They have disregarded questions related to consciousness, or have employed them as a measure of the child's usage of the term *alive*.

In a very well controlled investigation, Russell and Dennis (8) developed a standardized procedure for the study of child animism. Regarding a list of 20 objects, six of which were arranged on a table, each child was asked: "Is the ——— living or dead?" and "Why?" On the basis of his answers, each child was assigned to one of Piaget's four stages of animism, or to a "No Concept Stage" when ". . . the child was responding in the absence of any definite concept of the animate and the inanimate."

Russell (6) was also interested in establishing quantitatively the developmental course of child animism. In addition he investigated such factors as socio-economic status, sex, geographic location (urban, suburban, or rural residence), grade status, mental age, and chronological age. It was concluded that: "The stages of animism are equally related to both mental age and chronological age, the Coefficients of Mean Square Contingency for the combined groups being 0.59 and 0.62 respectively." No significant relationships were found between stage of animism and geographical location, socio-economic status, or sex of the subjects.

Russell (7) has also investigated what he termed "allied concepts," and their correlation with stage of animism. By allied concepts Russell means, ". . . ideas which are 'allied' in adult thought to those of animation, such as 'knowing' and 'feeling'." He continues, "The problem may be stated specifically as follows: Is the development of animism by characteristic stages merely a function of the child's usage of the terms 'living' and 'dead' or is the development due to more inclusive ideas concerning the nature of 'life' in general." Following the questions regarding "animism," one-half of 335 subjects were queried as follows: "Does the ——— know where it is? Why?" The other half were asked: "Does the ——— feel when I touch it?" (or a more plausible variation for remote objects) and "Why?" Upon the basis of these answers each subject was classified, ". . . on the same

basis as the classification of animistic responses." Russell found a 63 per cent correspondence between the stages of animism and the stages of allied concepts. On the basis of this evidence, he drew the following conclusions:

> These facts answer the question raised in the introduction of this paper as to whether or not the development of animism is merely a function of the subject's usage of the terms "living" and "dead." Since in the majority of cases the subject attributes "knowing" and "feeling" to those objects that he considers "living," and since the development of the two series of concepts follows the same progression of stages, the author feels justified in the use of the term "animism" as descriptive of the subject's ideas of "life."

Russell states: "Each subject was questioned individually, the questions involved in the present work being asked immediately following an examination for stages of animism." However, it is not clear whether questions about "knowing" or "feeling" were asked in a separate series after questions regarding "life" ("animism") had been completed for *all* objects, or whether they were asked regarding each object immediately after questions regarding "animism." If the latter was the case, it may be that a child who said that an object was "alive" would also tend to say that it could "know" or "feel" in order to be consistent.

Several investigators (1, 2, 3, 4) have made some attempt to refute experimentally Piaget's claim that when a child—at least a child in *Stage* 2—states that an inanimate object is "alive," he also attributes certain "characteristics of life" to that object, but it is felt that additional clarification is desirable.

Russell's study (7) dealing with "allied concepts" tends to support Piaget's view, but it is felt that a wider sampling of "allied" questions should be employed.

The present study is an attempt to determine what the child means when he states that an object is alive. Stated differently, when a child states that an *inanimate* object is alive, does he necessarily assign to that object certain sensory and functional attributes which the adult usually assigns to *animate* objects, particularly animals?

Piaget states that the study of the concept of "life" shows, ". . . the ideas children understand by the word 'life' " (5, p. 194). It is true that the child's answers to the "Why?" questions, that is, "Why do you think ——— is alive?," reveal in part what the child means by the word *alive*. However, it is felt that motion, or activity, is the reason most often cited by the child as the differentiating criterion between the "animate" and the "inanimate," because motion is the most prominent differentiating quality, and one which is relatively easy to express. Another approach to the child's concept of *alive* is to ask him several supplementary (allied) questions regarding sensory and functional attributes, such as feeling, breathing, thinking, etc.

Subjects

The subjects were obtained from the grade and junior high schools of Springdale, Pennsylvania (population approximately 5,000). Although IQ scores were not obtained, school officials stated that records indicate that the groups have mean IQs near or slightly above 100. Thirty subjects were selected from each of the following grades: kindergarten, first, third, fifth, and seventh (see Table 1). In order to screen out children who were either too young or too old for a particular grade, age limits were arbitrarily established for each group (see Table 1). Eleven students were eliminated by this screening.

Table 1

DESCRIPTIVE DATA REGARDING SUBJECTS

Grade	*N*	*Mean Age* Yrs. Mos.	*Males*	*Females*	*Arbitrary Age Limits*
K	23*	5–10	9	14	5–0 to 5–11
1	30	6– 9	13	17	6–0 to 7–11
3	29*	8–11	15	14	8–0 to 9–11
5	30	10–11	17	13	10–0 to 11–11
7	30	12–10	15	15	12–0 to 13–11
Totals ...	142		69	73	

* Seven kindergarten records and one third grade record were deleted because of perseveration (see Results).

The other criterion for elimination was whether a child had a sibling in one of the other grades to be tested. This was done to reduce the possibility of discussion of the test at home and instruction by parents of subjects who had not been tested. Thirty-eight students were eliminated on this basis. One child in the kindergarten group was eliminated because of serious nystagmus and questionable mental capacity. The subjects were selected from alphabetical lists of the remaining students.

Procedure

Materials. Six inanimate objects: a burnt kitchen match, a broken dish, a pocket knife with one blade open, a comb, an alarm clock which ticked loudly, and a lighted candle; and two animate objects: a goldfish in a glass bowl, and a flower (blooming petunia in a flower pot) were assembled on a table. It is felt that these objects represented a sample with which most children are familiar, and that the objects vary greatly as to real and/or apparent animation and functional value. In addition to extending the con-

tinuum to include objects which are really alive, the fish and the flower were included as control objects for two reasons: (*a*) as a basis for comparing the responses to inanimate objects, and (*b*) in order to reduce the likelihood of, and as a measure of, perseveration. With animate objects included, some correct responses are "No" while others are "Yes."

Questions. The following ten questions were asked regarding each object: 1. Is ———alive? 2. Would ——— feel pain if I stick a pin in it? 3. Does a ——— grow? 4. Can ——— hear us talking? 5. Does ——— breathe? 6. Does ——— think? 7. Can ——— see? 8. When ——— moves, does it know that it moves? 9. Can ——— make a wish? 10. Is ——— alive? Question 1 was repeated as question 10 to obtain a measure of the degree to which the child's usage of the term *alive* might change as a result of the intervening allied questions. It is felt that questions 2 through 9 (hereafter to be termed allied questions—following Russell) represent a sample of possible questions concerning sensory and functional attributes of higher forms of life, particularly man. The child's responses to these questions provide a basis for making inferences regarding (*a*) his concepts of these objects, and (*b*) what he means by the term *alive*.

No "Why?" questions were asked until all ten questions had been asked of all objects. It is felt that if a child is asked to give his reason for thinking a particular object is alive or not alive, he may employ his stated reason—which can be only a small part of his total concept—as a criterion for judging questions regarding other objects. "Why?" questions were asked in some cases after the formal questioning had been completed, particularly when the child stated that the clock or the candle was alive.

Each subject was questioned individually while seated opposite the experimenter; the objects were assembled on a table between them in random order (in terms of real and/or apparent animation). After a brief preliminary introduction to the situation, including for the younger children remarks to the effect that this was a "kind of game," each child was given the following instructions: "I am going to ask you some questions about the things you see on the table. Some will be easy and some not so easy. If you don't know the answer, just say, 'I don't know'."

The subject was asked: "Is the knife alive? Is the fish alive? Is the match alive?" etc., through the list of eight objects. When necessary, especially at the beginning of the questioning, the experimenter directed the subject's attention to the appropriate object by pointing. Responses were recorded on mimeographed answer sheets. Then the second question, "Would the ——— feel pain if I stuck a pin in it?" was asked regarding each object, then the third question, and so on. This procedure was employed in order to reduce perseveration. Although this does not eliminate the possibility of perseveration, it would have been much more likely to occur had all questions been asked regarding a given object, then another, etc.

The experiment was conducted during the latter half of May, thus during the latter part of the school term. The subjects were taken from regularly scheduled classes, and therefore had little opportunity to discuss the experiment until after all of their group had been tested.

Results

Deletion of cases. Seven cases in the kindergarten group (grade K) and one in grade 3 were deleted because of perseveration. In the judgment of the experimenter, the recorded responses, in addition to observations made during the testing, indicate that these eight subjects were responding with minimal reference to the stimuli (questions). Either because they did not comprehend the questions, or because of emotional stress—or a combination of these factors—the subjects resorted to answering nearly all questions either positively or negatively at some point during the testing. In each of two cases in grade K, for example, all responses were positive but one. Other records show either some evidence of attempted discrimination followed by stereotyped responses, or alternate series of positive and negative responses followed by stereotyped responses.

With reference to the original data (150 cases), seven cases of perseveration in grade K accounted for 68 per cent of the positive allied responses for that grade, while one case of perseveration accounted for 49 per cent of the positive allied responses in grade 3. Therefore, the records of these eight cases were deleted. All tabulations and computations throughout this paper are based on the remaining 142 cases. When grade comparisons are made, the data are prorated and appropriate notations made.

Table 2

TOTAL NUMBER OF POSITIVE RESPONSES FOR FIVE GRADES*

Questions: Objects	1 *alive*	2 *feel*	3 *grow*	4 *hear*	5 *breathe*	6 *think*	7 *see*	8 *know*	9 *wish*	10 *alive*
Match	8	5	3	1	2	1	1	6	2	4
Dish	10	7	1	2	1	1	1	5	0	4
Knife	18	14	1	2	0	3	2	7	2	5
Comb	21	5	1	2	1	0	1	5	3	4
Clock	66	12	3	5	1	4	4	14	3	34
Candle	77	11	7	1	19	1	2	8	9	43
Totals	200	54	16	13	24	10	11	45	19	94
Flower	110	45	135	3	34	8	4	20	5	95
Fish	142	133	122	49	131	99	134	131	55	142

* Eight cases of perseveration deleted but remaining data *not* prorated.

Table 2 presents the combined data for five grades. It will be noted that the child's concept of a fish is quite different from his concept of inanimate objects.

Comparison of responses to question 1 and to allied questions. Table 3 shows a comparison of the mean number of positive responses per grade to question 1 for four objects (match, dish, knife, and comb), and the mean number of positive responses per grade for two objects (clock and candle); and the respective *means* for four objects and two objects of the

TABLE 3

MEAN NUMBER OF POSITIVE RESPONSES* TO QUESTION 1 FOR COMBINED OBJECTS; AND THE CORRESPONDINGS MEANS OF THE MEAN NUMBER OF POSITIVE ALLIED RESPONSES

	Question 1		Mean Allied	
Grade	*Match, Dish, Knife, Comb*	*Clock, Candle*	*Match, Dish Knife, Comb*	*Clock, Candle*
K	9.1	15.6	2.8	3.5
1	3.8	7.5	.3	1.0
3	1.6	18.1	.2	1.0
5	1.5	23.0	.1	1.0
7	0.5	11.5	0.0	.8
TOTALS ...	16.5	75.7	3.4	7.3

* Prorated.

mean number of positive responses to the allied questions. The figures in the allied columns are the means for combined objects of the mean number of positive responses to eight allied questions. Thus, for each object the mean number of positive responses to eight allied questions was taken as a measure of the degree of "animism" implied by the word *alive.*

The rationale for combining clock and candle as opposed to the other four objects is that the clock and the candle evinced activity. The clock ticked loudly and the hands moved; the candle was burning.

For four objects combined, those evincing no activity, there is a progressive decrease in the mean number of positive responses to question 1 and to allied questions from grade K through grade 7, indicating that as the assignment of allied attributes decreases, there is a corresponding decrease in the frequency of positive *alive* responses.

But the patterns for clock and candle combined, objects which evince activity, do *not* follow this trend. Compared with grade 1, there is an in-

crease in the number of positive responses to question 1 for clock and candle combined of over 100 per cent at grade 3, and over 200 per cent at grade 5. There is not a corresponding increase in the number of positive responses to the allied questions. The data indicate that, although children do assign more allied attributes to clock and candle than to the other four objects, the discrepancy is not proportional to the discrepancy in the relative proportions of positive *alive* responses.

On the average there were 359 per cent more positive *alive* responses (to question 1) for clock and candle than for the other inanimate objects; whereas, there were only 115 per cent more positive *allied* responses for clock and candle than for the other four objects (see Totals, Table 3).

Compared with a total of 200 positive responses (not prorated) to question 1 for all groups (see Table 2), there were only 54 positive responses to question 2 (feeling), and 45 to question 8 (knowing), and many fewer positive responses to the other allied questions. These figures vary considerably from Russell's (7) which indicate that, ". . . in the majority of cases the subject attributes 'knowing' and 'feeling' to those objects that he considers 'living,' . . ."

Although 25 subjects in grade 5 stated that the candle was alive, only one stated that it can feel pain, one stated that it grows, none that it can see, two that it knows when it moves, and one that it can make a wish. When asked why the clock was alive, the subject usually answered: "It ticks," or occasionally, "The hands move," or "It tells time."

The child does not regard these objects as being human-like, with many of the sensory and functional attributes of human beings. The fact that an inanimate object evinces some activity or function is sufficient basis for the child to say that the object is alive, by which he apparently means that it is *lively*—evinces activity. It seems to be a matter of limited vocabulary rather than a gross misinterpretation of reality.

Comparison of responses to question 10 and to allied questions. Responses to question 10 are in a sense corrected responses to question 1 after the subject experiences the intervening allied questions. Regarding the inanimate objects, there was a 54 per cent reduction in the total number of positive responses (prorated)—217.0 for question 1, 100.3 for question 10.

Table 4 shows a comparison of the mean number of positive responses per grade to question 10 for four objects (match, dish, knife, and comb), and the mean number of positive responses per grade for two objects (clock and candle); and the respective *means* for four objects and two objects of the *mean* number of positive allied responses. As in Table 3, the figures in the allied columns are the means for combined objects of the mean number of positive responses to eight allied questions. For four objects combined, there is a progressive decrease in the mean number of positive responses to question 10 from grade K through grade 5; there were no positive responses at grade 5, and only one positive response at grade 7 for these objects. Com-

TABLE 4

MEAN NUMBER OF POSITIVE RESPONSES* TO QUESTION 10 FOR COMBINED OBJECTS; AND THE CORRESPONDING MEANS OF THE MEAN NUMBER OF POSITIVE ALLIED RESPONSES

Grade	Question 10		Mean Allied	
	Match, Dish, Knife, Comb	*Clock, Candle*	*Match, Dish, Knife, Comb*	*Clock, Candle*
K	2.6	7.2	2.8	3.5
1	1.2	5.5	.3	1.0
3	.8	9.8	.2	1.0
5	0.0	12.5	.1	1.0
7	0.2	5.5	0.0	.8
TOTALS ...	4.8	40.5	3.4	7.3

* Prorated.

pared with grade 1, there was a mean increase in positive responses to question 10 for clock and candle of 78 per cent at grade 3, and 127 per cent at grade 5. Although these percentage increases are smaller than the relative increases for question 1, there were on the average 743 per cent more positive *alive* responses (to question 10) for clock and candle than for the other inanimate objects, as compared with 115 per cent more positive *allied* responses for clock and candle than for the other four objects (see Totals, Table 4). The discrepancy seems to result primarily from the child's usage of the term *alive* rather than from a misconception of the nature of these objects.

DISCUSSION

It is true that some children do assign certain sensory and functional attributes to inanimate objects, and particularly a kind of elementary sensitivity and awareness (feeling and knowing—questions 2 and 8), but the assignment of sensory and functional attributes is entirely out of proportion to the assignment of the term *alive* to these objects. Although there is some evidence of animism (particularly in the kindergarten group) as indicated by incorrect responses regarding the sensory and functional attributes of inanimate objects, there is little evidence of a gross misinterpretation of the nature of these objects. When the child at grade 3, 5, or 7 states that the clock or candle is alive, he seems to mean primarily that the object is *lively*—evinces activity. This seems to result from the child's misuse of the term *alive* rather than from a misinterpretation of activity *per se*. That is,

the child does not conceptually classify these objects in the same category as animals, or animals and plants, but he is unable to make the distinction verbally.

If the adult accepts the child's positive responses to the *alive* questions at face value, with a literal translation from the adult's point of view, he must then postulate an irregular developmental trend in the child's concepts of some objects, and a more or less regular trend for others. That is, one would have to conclude that, compared with children between the ages of 6 and 8 (grade 1), children between the ages of 8 and 14 (grades 3 through 7) have inferior concepts regarding the nature of certain objects (those evincing activity), and at the same time have superior concepts regarding the nature of other objects (those not evincing activity). This would indicate a gross deviation from other mental and physical developmental trends.

It is hypothesized that the reason for the fact that children in grade 1 give fewer positive responses to *alive* questions regarding clock and candle than children in grades 3, 5, and 7 is because the younger children adopt a more elementary frame of reference. That is, more of the younger children divide the objects into animal versus non-animal groupings; whereas, more of the older children visualize a continuum of animation. Conceptually, the older child makes a distinction between objects which evince activity and those which do not, but in so doing misuses the term *alive*.

The data seem to support the views of those who have disagreed with some of Piaget's findings regarding child animism. Contrary to Russell's findings, a majority of the subjects who stated that an inanimate object was alive did not attribute "feeling" and "knowing" to that object. Factors contributing to the discrepancy between Russell's findings and the results of the present study may have been: different sequences of questioning (if in fact there was a difference); the inclusion of "Why?" questions by Russell within the formal testing; differences in the wording of questions; and the employment of more allied questions in the present study.

Summary and Conclusions

In an effort to clarify the concept of animism, a series of questions designed to determine what the child means when he states that an object is alive was administered to 150 school children. The following results are indicated:

1. Subjects much more frequently stated that inanimate objects were alive than they attributed sensory and functional attributes to these objects.
2. From kindergarten through grade 7 there was a progressive decrease in the number of subjects who stated that inanimate objects which did *not* evince activity were alive. There was a parallel trend toward a progressive decrease in the number of sensory and functional attributes assigned to these objects.

3. From kindergarten to grade 1 there was a decrease in the number of subjects who stated that inanimate objects which *did* evince activity were alive, after which there was a marked increase at grade 3, and again at grade 5, followed by a decrease at grade 7. There was *not* a parallel trend in the number of sensory and functional attributes assigned to these objects.

4. After answering the allied questions, there was a marked reduction in the number of subjects who stated that the six inanimate objects were alive, but in general the above-mentioned trends (2 and 3) were sustained.

In the opinion of the author, the child's statement that a certain object is alive is an inadequate measure of animism. Data indicating that many children as old as 14 years are still quite animistic have resulted when this measure was employed. It is felt that data regarding what the child terms *alive* are more revealing of the child's usage of the term *alive* than a measure of animism. The present data indicate that when a child states that an inanimate object is alive, particularly an object which evinces activity, he means much less by this term than most adults do, and much less than Piaget seems to have implied that the child means.

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YOUNG CHILDREN'S RESPONSES TO A PICTURE AND INSET TEST DESIGNED TO REVEAL REACTIONS TO PERSONS OF DIFFERENT SKIN COLOR

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What do differences in skin color mean to young children? Incidental observations in university nursery schools suggest that there is little awareness of the racial significance of skin color.

Three-year-olds in a midwestern nursery school, noting the daily appearance of a Negro maid to pick up one of the children, called to him, "Here's your mother." Four-year-olds, in a western nursery school a few days following Pearl Harbor, ran around the yard with a newly enrolled Japanese boy, unitedly bombing "Japs." The skin color of their playmate and his mother excited no comment.

Children in these university nursery schools were, however, a somewhat selected group. Their parents in most cases were college graduates. Their fathers were engaged in professions or in occupations of managerial or executive type. Their homes, if not in the best residential areas, were at least in desirable ones.

Clark and Clark (2), Helgerson (6), Radke, Trager, et al. (11, 12), dealing primarily with children of low socio-economic status, report that by five years of age skin color is perceived as possessing both racial and social significance.

In the light of this divergent evidence, the present study was undertaken with the purpose of exploring the significance of family economic and social circumstances on young children's responses to persons of different skin color.

Table 1 summarizes information concerning age, sex, ethnic group, and socio-economic status of the children in the study.

It was originally intended to include groups of children with and without ethnic group experience in school, and to compare responses of Negro and white children of upper as well as lower socio-economic status. However, preliminary inquiry revealed that schools were either Negro or white with a negligible percentage of children of the other race in attendence, and that there were no Negro groups which could be considered comparable with the white upper socio-economic groups.

[1] The writers are indebted to Dr. Elizabeth L. Scott of the Mathematics Department for mathematical assistance and to the School Departments and Child Care Centers of Berkeley, Oakland, and San Francisco for their effective cooperation.

TABLE I

FREQUENCY OF CASES STUDIED, CLASSIFIED ACCORDING TO AGE, SEX, ETHNIC GROUP, AND SOCIO-ECONOMIC STATUS

		Lower Socio-Economic Status		Upper Socio-Economic Status	
Age	*Sex*	*Negro*	*White**	*White*†	*Totals*
3 years	Male	24*	24	24	72
3 years	Female	24*	24	24	72
5 years	Male	24‡	24	24	72
5 years	Female	24‡	24	24	72
		96	96	96	288

* All from San Francisco.
† All from Berkeley.
‡ All from Oakland.

Socio-economic classification was based on parents' ocupation, education, and housing, and on the median I.Q. of the children. In both the three- and five-year-old upper socio-economic groups, over half the parents were engaged in professions; approximately one-third occupied managerial positions. The residential area from which both groups were drawn was the most desirable in the community. It was, incidentally, not ethnically exclusive. Median I.Q. for the three-year-olds was 128, for the five-year-olds, 121.

In both the three- and five-year-old white lower socio-economic groups, more than one-half the children's parents were engaged in unskilled, semi-skilled, and skilled labor, and some were unemployed. The three-year-olds attended a state supported child care center where enrollment was restricted to low income families in which it was necessary for the mother to work. Residential areas for both groups were among the less desirable in the community. They were within or bordering ethnically mixed neighborhoods. Median I.Q. for the three- and the five-year-old group was approximately 100.

Both three- and five-year-old Negro children had parents whose occupations and housing facilities approximated, but were at a slightly lower level than those of the white low socio-economic group. The three-year-olds attended the state child care centers. Both three- and five-year-olds lived in congested industrial areas in which sub-standard housing was common. The five-year-olds lived in an exclusively Negro neighborhood, the three-year-olds in a predominantly Negro neighborhood. Mental test scores were not available for either group of children.

The terms upper and lower class, used for the sake of brevity in this study, therefore distinguish, on the basis of fathers' occupation, between a

professional or executive group and a group of semiskilled or unskilled workers.

The Picture and Inset Test

Research literature on test performance (3, 13), perception (1), and reasoning (4, 5) in young children suggests the nature of the problems to be solved in devising a test suitable for children with an age span from 36 to 71 months.

Table 2

PICTURE INSET SERIES FOR BOYS

PICTURE FIGURE		INSET FIGURE			
Skin Color — White			*White*	*Brown*	*Black*
1A*	Boy	Boy	a†	b†	c†
2A	Boy	Baby	a	b	c
3A	Boy	Woman	a	b	c
4A	Boy	Man	a	b	c
5A	Woman	Man	a	b	c
6A	Girl	Girl	a	b	c
Skin Color — Brown			*White*	*Brown*	*Black*
1B*	Boy	Boy	a	b	c
2B	Boy	Baby	a	b	c
3B	Boy	Woman	a	b	c
4B	Boy	Man	a	b	c
5B	Woman	Man	a	b	c
6B	Girl	Girl	a	b	c
Skin Color — Black			*White*	*Brown*	*Black*
1C*	Boy	Boy	a	b	c
2C	Boy	Baby	a	b	c
3C	Boy	Woman	a	b	c
4C	Boy	Man	a	b	c
5C	Woman	Man	a	b	c
6C	Girl	Girl	a	b	c

*ABC refers to skin color of figure in picture.

† abc refers to skin color of figure in inset.

1 - 6 refers to picture and inset person-combination, thus picture "3A" completed with inset "a" portrays a white boy with a white woman.

A picture and inset test requiring the choice of one of a pair of insets to complete a picture seemed the most satisfactory solution. It was clear immediately, however, that to be within the comprehension of three-year-olds of average or lower intelligence the picture content would have to be familiar and neutral in feeling tone. Two series of pictures were therefore developed, one for boys and one for girls. Each series contained 18

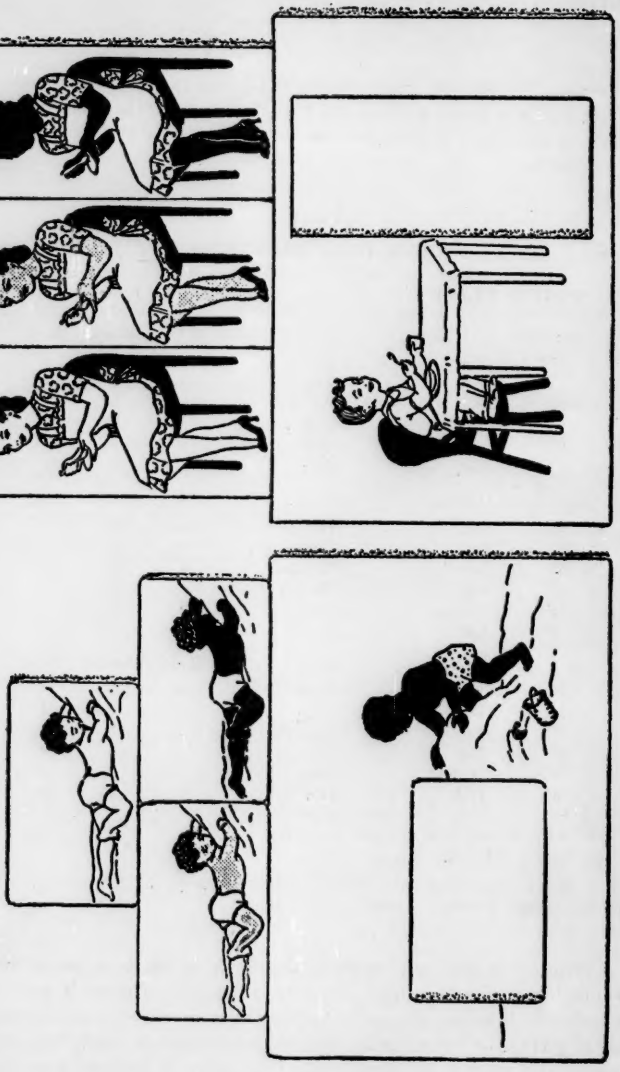

FIGURE 1—Two of the picture and inset person-combinations used in the inset test.

pictures which when completed with an inset showed two persons in such familiar activities as playing, eating, bathing, riding, walking, and waking up in the morning. Each picture had three accompanying insets identical in all respects save skin color. Table 2 indicates the person-combinations represented.

TABLE 3

FACTORS HELD CONSTANT IN PRESENTATION OF 54 PAIRS OF INSETS

Presentation	*Skin Color of Figure in Inset*	Number Presented			Matching Possibilities		
		Total	*Right*	*Left*	*Total*	*Right*	*Left*
First	White a	12	6	6	4	2	2
	Brown b	12	6	6	4	2	2
	Black c	12	6	6	4	2	2
Second	White a	12	6	6	4	2	2
	Brown b	12	6	6	4	2	2
	Black c	12	6	6	4	2	2
Third	White a	12	6	6	4	2	2
	Brown b	12	6	6	4	2	2
	Black c	12	6	6	4	2	2
Total	White a	36	18	18	12	6	6
	Brown b	36	18	18	12	6	6
	Black c	36	18	18	12	6	6

Eighteen matching choices possible on the right and on the left.

Equal occurrence of each permutation: ab ac bc, ba ca cb.

Each picture matched once on right, once on left.

Each picture and inset person-combination presented with a white, a brown, and a black skinned figure on the right hand and on the left in each presentation.

Construction details concerning the pictures are that they were painted with a quick drying lacquer on 12" x 15" masonite rectangles and finished with a clear shellac on both sides. Colors chosen were recommended by the University Decorative Art Department as being equally pleasing with white, brown, and black skins. Negro facial characteristics other than skin color were suggested but not emphasized. Slight variations in background and clothing were made for the six A, B, and C pictures and insets so that children might not tire of them. For instance, 1A shows two boys piling blocks in a wagon; 1B, two boys on a rocking boat; and 1C, two boys making a sand castle. Figure 1 shows two different picture and inset person-combinations. Inset figures are light white in one, black in one, and brown in another inset.

Presentation of Pictures and Insets

All presentation factors which, in preliminary tests, seemed to affect children's choice of insets were held constant. See Table 3. A recent article (8) discusses in detail the need for this procedure. A sample form of the check and tabulation sheet used for individual children is shown in the Appendix.

Each of the eighteen pictures was presented on three separate occasions with one of the three possible pairings of insets. A young white woman tested the six groups of children. While a question may be raised concerning the effect of a white tester on Negro children, the alternative of a Negro for Negro children and a white tester for white children would also have introduced a social variable. Incidentally, both three- and five-year-old Negro children had white teachers.

In presenting the pictures the tester said, in the case of the first picture, "Here is a picture of two boys playing. Which of these boys (indicating the insets) would you like to put in?" The child's choice of insets was circled and any spontaneous comments recorded.

Data Available from Responses to Picture and Inset Test

The number of times each child could choose a figure of white, brown, or black skin color is summarized in Table 4. Also summarized are the number of times in which skin color of a figure in one of the insets matched that in the picture and the number of times neither inset matched in this way.

The data thus make possible group, age, and sex comparisons of total skin color choices, of matching skin color choices, and of skin color choices when neither inset matched picture skin color. In addition, it is possible to compare skin color choices in terms of different persons represented in the inset, and of first and third presentation of the series. As a pair of insets necessarily assume a right and left position, it is also possible to

Table 4

NUMBER OF TIMES INSETS PORTRAYING DIFFERENT SKIN COLORS WERE PRESENTED

Type of Paired Presentation	*Skin Color of Inset Figures*			*Total Paired Presentations*
	White	Brown	Black	
Matching Member of Pair ..	12	12	12	36
Non-Matching Member of Pair	12	12	12	..
Member of Pair of Non-Matching Insets	12	12	12	18
Member of Pair	36	36	36	54

compare children's right and left choices. Supplementary information includes analysis of children's spontaneous comments during presentation of series.

TABLE 5

PERCENTAGES OF TIMES SKIN COLOR WAS CHOSEN WHEN PRESENTED AS A MEMBER OF A PAIR*

Age Years	*Sex*	*Social Group*	Skin Color Choice *White* %	*Brown* %	*Black* %
5	Boys	White Upper Class	49.3	58.1	42.6
5	Boys	White Lower Class	64.1	54.2	31.7
5	Boys	Negro Lower Class	68.1	55.0	26.5
3	Boys	White Upper Class	46.8	53.8	49.4
3	Boys	White Lower Class	59.6	45.8	44.6
3	Boys	Negro Lower Class	62.1	50.9	36.6
5	Girls	White Upper Class	51.0	57.0	41.9
5	Girls	White Lower Class	58.1	54.3	37.7
5	Girls	Negro Lower Class	66.0	53.1	30.8
3	Girls	White Upper Class	56.8	51.4	41.7
3	Girls	White Lower Class	51.7	52.0	46.3
3	Girls	Negro Lower Class	59.6	53.7	36.7

*In each of 12 groups of 24 children, there were 864 opportunities to choose each skin color when presented as a member of a pair.

RESULTS

Total skin color choices. Table 5 summarizes children's choices of skin color when presented as a member of a pair. Scores for each of the 12 groups of children are based on 864 choices.

Social group differences show a consistent pattern for three- and five-year-old boys and five-year-old girls. Choice of white skin by groups shows the following descending order of frequency: Negro, white lower class, white upper class. Choice of black skins shows a reverse order: white upper class, white lower class, Negro.

The departure from this pattern shown by the white three-year-old girls may be ignored because none of the differences between upper and lower class white girls are statistically significant.

Age differences are reflected in an increase in choice of white (by all groups save the white upper class girls), an increase in choice of brown (by all save Negro girls), and a decrease in choice of black (in all save white upper class girls).

Sex differences reveal an interesting reversal in boys' and girls' choices of white and black skin color when white upper are compared with white lower class and Negro groups. In the upper class white groups, girls make more choices of white and fewer choices of black skin color than boys. In the lower class white and Negro groups, girls make fewer choices of white and more choices of black skin color than the boys.

It is not psychologically meaningful to compute measures of significance for the differences summarized, because two factors contributed to them —children's interest in matching and their interest in skin color *per se*. It is therefore necessary to examine and compare children's responses when only one of these factors was operating. Reference to Table 4 shows that white, brown, and black skin color could each be chosen twelve times as a match for the skin color of the figure in the picture. White, brown, and black skin color could also be chosen twelve times when neither pair of insets matched skin color of the figure in the picture.

Matching skin color choices. Total matching choices (Table 6) show consistent group differences at both ages and for both sexes. The white upper class groups match most, the Negroes least, and the white lower class groups are intermediate.

Tests of the statistical significance of differences in matching choices by the various sex, age, social, and ethnic groups showed that

TABLE 6

PERCENTAGE OF TIMES CHILDREN MATCHED SKIN COLOR WHEN POSSIBLE*

Age Years	*Sex*	*Group*	*White* %	*Brown* %	*Black* %	*Range*† %	*Total* %
5	Boys	White Upper	81.1	74.1	73.1	8.0	75.6
5	Boys	White Lower	79.2	60.4	47.2	32.0	62.3
5	Boys	Negro Lower	74.7	59.0	30.5	44.2	54.7
3	Boys	White Upper	61.5	60.8	62.9	2.1	61.3
3	Boys	White Lower	70.1	53.1	51.7	18.4	59.5
3	Boys	Negro Lower	66.7	53.5	46.2	20.5	54.2
5	Girls	White Upper	80.8	73.8	73.1	7.7	75.3
5	Girls	White Lower	79.2	66.0	58.0	21.2	67.7
5	Girls	Negro Lower	69.1	57.3	37.2	31.9	54.5
3	Girls	White Upper	67.8	59.1	55.3	12.5	60.4
3	Girls	White Lower	64.6	59.3	56.6	8.0	60.2
3	Girls	Negro Lower	65.3	55.2	42.0	23.3	55.4

* In each of 12 groups of 24 children, there were 288 opportunities to match each skin color when presented as a member of a pair.

† Range refers to difference or spread between highest and lowest percentage obtained by a group for different skin color choices.

(1) There are no significant sex differences.

(2) As far as age differences are concerned, those for Negroes are not significant.
Among the white children,
  (*a*) Lower class white children show only a slight tendency ($p = .10$) for older girls to match more than younger girls.
  (*b*) Upper class white children show significant age differences. Older girls match more than younger girls ($p = .01$). Older boys to a lesser extent ($p = .05$) match more than younger boys.

(3) Regarding differences between social classes, the three-year-olds show no significant differences.
Among the five-year-olds,
  (*a*) Negro girls match significantly less frequently ($p = .01$) than upper white and lower white class girls.
  (*b*) Negro boys match significantly less frequently ($p = .01$) than white upper class boys, but not less frequently than white lower class boys.
  (*c*) Between white upper and lower class boys and girls there is some tendency ($p = .05$) for upper class boys to match more than lower class boys, and a lesser tendency ($p = .10$) for upper class girls to match more than lower class girls.

Tentatively one might explain social group differences on the basis of differences in intelligence levels. Ability to distinguish likeness and difference is a part of mental test performance. However, the picture series was not presented as a problem in distinguishing likeness and difference. Therefore, a high total matching score must be interpreted as lack of concern for skin color *per se*. This interpretation is supported by the relative frequency of matching the three skin colors by the three social groups.

The ranges in matching scores for the three skin colors (see Table 6) show (with the exception of the white three-year-old girls) consistent social group differences at both ages and for both sexes. Differences between these ranges suggest group differences in response for the different skin colors (save for the three-year-old girls). Apparently, the white upper class groups perceive the picture and inset series as a *matching problem*.

The lower white groups, though revealing a tendency to match skin color, show (with the exception of the three-year-old girls) a significant difference in the number of times they match white rather than brown or black skin color. To these children the picture and inset series is apparently perceived as a *problem involving skin color preferences as well as matching*.

The Negroes whose matching responses are not much above chance expectancy show significant differences in choice of white over black,

TABLE 7

SIGNIFICANCE OF DIFFERENCES* IN MATCHING INSET AND PICTURE SKIN COLORS

Age Years	*Sex*	*Group*	*White–Black p*	*White–Brown p*	*Brown–Black p*
5	Boys	White Upper	—	—	—
5	Girls	White Upper	—	—	—
5	Boys	White Lower	.01	.01	—
5	Girls	White Lower	.01	.05	—
5	Boys	Negro Lower	.01	.10	.01
5	Girls	Negro Lower	.01	.05	.01
3	Boys	White Upper	—	—	—
3	Girls	White Upper	.05	.10	—
3	Boys	White Lower	.01	.01	—
3	Girls	White Lower	—	—	—
3	Boys	Negro Lower	.01	.05	—
3	Gilrs	Negro Lower	.01	.05	.10

* Based on a modification of Wilcoxon's rank test (7, 9, 15).
— indicates figures greater than .10.

white over brown, and even brown over black. To them the series is apparently perceived as a *problem in skin color preference.*

As will be discussed later, children's spontaneous verbalizations supported these interpretations of their choices.

Tables 7 and 8 reveal that patterns of response and differences between social groups become more significant with age. The Negro children appear to show the least change of the three groups. This suggests that environmental influences affecting children's responses to skin colors may be effective earlier in the Negro than in the white groups.

Slight but non-significant sex differences appear to be dependent on socio-economic status in white three-year-olds. Upper white girls and lower white boys show a more selective response to white skin color than upper white boys and lower white girls. This finding recalls Goodenough's (3) report that sex differences in social behavior in a mental test situation were dependent on socio-economic status of the children.

Skin color choices when matching was not possible. Brown skin color choices could result from *attempts to match* as well as from skin color preferences *per se.* In the 18 presentations in which it was not possible to match, the picture and inset skin colors were as follows:

No. of Presentations	*Pictures*	*Inset*
6	A	b c
6	B	a c
6	C	b a

TABLE 8

SIGNIFICANCE* OF SOCIAL GROUP, AGE AND SEX DIFFERENCES IN MATCHING SKIN COLORS

SOCIAL GROUP DIFFERENCES

	White			*Brown*			*Black*		
	WU-WL	WU-NL	WL-NL	WU-WL	WU-NL	WL-NL	WU-WL	WU-NL	WL-NL
Age Sex	*p*	*p*	*p*	*p*	*p*	*p*	*p*	*p*	*p*
5 yr Boys	—	—	—	.05	.05	—	.01	.01	.10
5 yr Girls	—	.05	.05	—	.01	.10	.05	.01	.01
3 yr Boys	.05	—	—	—	—	—	—	.05	—
3 yr Girls	—	—	—	—	—	—	—	—	.10

AGE DIFFERENCES

Sex	*Group*	*White* *p*	*Brown* *p*	*Black* *p*
Boys	White Upper	.01	.05	—
Boys	White Lower	.10	—	—
Boys	Negro Lower	.10	—	.05
Girls	White Upper	.05	.01	.05
Girls	White Lower	.05	—	—
Girls	Negro Lower	—	—	—

SEX DIFFERENCES

Age Years	*Group*	*White* *p*	*Brown* *p*	*Black* *p*
5	White Upper	—	—	—
5	White Lower	—	—	—
5	Negro Lower	—	—	—
3	White Upper	—	—	—
3	White Lower	—	—	—
3	Negro Lower	—	—	—

* Based on a modification of Wilcoxon's rank test (7, 9, 15).
— indicates figures greater than .10.

These combinations make possible 12 near matches with brown, 6 with white, 6 with black. For example, when A is presented with b c, b, the brown skin, is a near match to white compared with c, the black skin. Spontaneous comments of the upper class white children revealed their attempts at near matching. "This is the closest I can get" is typical.

TABLE 9

PERCENTAGE OF TIMES CHILDREN CHOSE SKIN COLOR WHEN NEITHER INSET MATCHED PICTURE SKIN COLOR*

Age Years	*Sex*	*Social Group*	*White* %	*Brown* %	*Black* %	*White-Black Range*† %
5	Boys	White Upper	40.6	76.0	33.3	7.3
5	Boys	White Lower	59.4	62.2	28.4	31.0
5	Boys	Negro Lower	66.7	54.5	28.8	37.9
3	Boys	White Upper	36.1	64.2	49.6	13.8
3	Boys	White Lower	58.3	46.2	45.5	12.8
3	Boys	Negro Lower	61.1	56.3	32.6	28.5
5	Girls	White Upper	43.1	74.7	32.3	10.8
5	Girls	White Lower	48.3	66.3	35.4	12.9
5	Girls	Negro Lower	67.3	52.8	29.8	37.5
3	Girls	White Upper	48.6	62.8	38.5	10.1
3	Girls	White Lower	48.6	56.3	45.1	3.5
3	Girls	Negro Lower	57.9	57.9	34.0	23.9

* In each of 12 groups of 24 children, each skin color was presented 288 times as a member of a pair.

† Range refers to difference or spread between percentages of choices for black and for white skins.

Because measures of significance of group differences in brown skin choices would not be psychologically meaningful, group ranges and measures of significance are presented only for white and black skin choices (see Tables 9 and 10).

They are as follows:

Ranges of choice for white and black skin colors shows consistent social group differences at five years for both sexes. The Negroes at both ages and of both sexes show the greatest discrimination between white and black. At the five year level, upper whites show the least discrimination and the lower whites are in an intermediate position between upper whites and Negroes.

For white skins a consistent descending order of frequency was obtained at both ages and for both sexes—Negroes greatest number of choices, upper whites least, lower whites intermediate.

The significance of social group, age, and sex differences obtained are summarized in Table 10.

White skins are chosen significantly more often by Negroes than upper whites at both ages, and by both sexes at five years. White skins are also chosen significantly more often by lower white boys than upper white boys of both ages, and by Negro than lower white five-year-old girls.

TABLE 10

SIGNIFICANCE* OF DIFFERENCES IN SKIN COLOR CHOICES WHEN NEITHER INSET MATCHED PICTURE IN SKIN COLOR

SOCIAL GROUP DIFFERENCES

Age Years	Sex	White Upper — White Lower p	White Upper — Negro Lower p	White Lower — Negro Lower p
White Skin Color				
5	Boy	.05	.01	—
5	Girl	—	.01	.05
3	Boy	.01	.01	—
3	Girl	—	.10	—
Black Skin Color				
5	Boy	—	—	—
5	Girl	—	—	—
3	Boy	—	.01	.05
3	Girl	—	—	.05

AGE DIFFERENCES

Sex	Social Group	White Skin Color p	Black Skin Color p
Boys	White Upper	—	.01†
Boys	White Lower	—	.01†
Boys	Negro Lower	—	—
Girls	White Upper	—	—
Girls	White Lower	—	—
Girls	Negro Lower	—	—

SEX DIFFERENCES

Age	Social Group	White Skin Color p	Black Skin Color p
5	White Upper	—	—
5	White Lower	—	—
5	Negro Lower	—	—
3	White Upper	.05‡	—
3	White Lower	—	—
3	Negro Lower	—	—

* Based on a modification of Wilcoxon's rank test (7, 9, 15).
— indicates figures greater than .10.
† Choice of black decreased with age.
‡ Greater preference for white skin by girls.

Differences in black skin choices are significant at the three year level only. Negro boys choose black skin color significantly less frequently than upper white and lower white boys. Negro girls choose it significantly less frequently than lower white girls.

Upper and lower white boys show a decrease in choice of black skin with age. Upper white three-year-old girls choose white skins more often than upper white boys.

Briefly, children's skin color choices, when matching is not possible, confirm the social group and age tendencies already noted.

TABLE 11

FREQUENCY OF SPONTANEOUS COMMENTS OF CHILDREN WITHIN EACH AGE, SOCIAL-GROUP CATEGORY

	Five-Year-Olds			Three-Year-Olds			
	White Upper 16 boys 17 girls	*White Lower* 14 boys 14 girls	*Negro Lower* 9 boys 10 girls	*White Upper* 11 boys 12 girls	*White Lower* 8 boys 6 girls	*Negro Lower* 8 boys 9 girls	*Total*
Similarities Matching: "This is a black lady just like that boy. It matches."	139	75	38	62	12	5	331
Simple description of color: "The baby's white. That's a brown girl."	59	42	22	32	32	41	228
Preference: "She's a good lady. I like to choose white."	19	8	24	5	3	7	66
Preference and Hostility: "That's a bad daddy, I want the good daddy."	5	4	4	0	1	18	32
Hostility: "I don't like this kind. That lady is too brown."	1	0	6	1	1	16	25
Totals for preference and hostility	25	12	34	6	5	41	123
Use of racial terms	49	15	0	10	0	0	74
Causation of Color: "She got dirty. My baby brother is lighter. He doesn't stay in the sun so much."	9	8	2	3	0	1	23
Unclassified	3	0	0	7	0	0	10
TOTALS	284	152	96	120	49	88	789

Before summarizing, some supplementary data are worth consideration.

Spontaneous comments of children. As only some of the children tested spoke, and as some groups had more speakers than others, reliable intergroup comparisons are not possible. Table 11 reveals that the white upper class children made the greatest number of comments about matching at both ages, and that the Negroes at both ages made the greatest number of remarks showing preference for white and hostility to dark skins.

Comparison of children's skin color choices in terms of the person represented. When rank orders were determined for the frequency with which children chose insets of different skin color in terms of the six different persons represented in the insets, no discernible pattern of response was evident. It is possible, however, that in a southern state children's choice of skin color may be affected by the person represented.

Comparison of children's skin color choices in first and third presentation of the series. Differences were so slight and inconsistent in terms of social group, age, and sex variables that it seems unlikely that increasing familiarity with the series affects children's choices of skin colors.

Choices of inset to child's right. As the summary (Table 12) indicates, any study involving a choice of objects which assume a right-left position in relation to young child subjects must control this variable, particularly with children as young as three years.

TABLE 12

PERCENTAGE OF TIMES INSET ON CHILD'S RIGHT WAS CHOSEN

Age	*Social Group*	*Boys* 1296 Choices %	*Girls* 1296 Choices %	*Total* 2592 Choices %
5	Upper White	51.9	52.2	52.1
5	Lower White	51.7	51.7	51.7
5	Negro	55.9	58.4	57.2
3	Upper White	58.0	63.9	60.9
3	Lower White	66.4	59.2	62.8
3	Negro	63.0	58.2	60.5

SUMMARY

Forty-eight three- and five-year-old children of white upper, white lower, and Negro lower socio-economic status (228 in all) were presented with a picture and inset test designed to reveal reactions to persons of white, brown, and black skin color.

The test required each child to make 54 choices of one of a pair of insets to complete a picture. In 36 choices one of the insets matched the picture in skin color of the person represented, in 18 neither inset did. Children's choices revealed social group, age, and sex differences in patterns

of response which appeared to reflect environmental influences dependent on socio-economic status.

The white upper class groups apparently perceived the picture inset series as a matching problem. They made more matching responses at each age level than the white lower class and Negro groups. They also made more comments about matching than the other two groups. Social group differences in matching choices were all significant at the five year level. The upper class whites also showed no significant differences in their choice of skin colors, indicating that skin color *per se* was not perceived as an important factor in their choice.

The white lower class groups resembled the Negroes in showing significant differences in their choice of white skins when paired with brown or black skins. Though they showed a greater tendency to match than the Negroes, there were significant differences in their matching choices for different skin colors. In this group, skin color was apparently perceived as an important and determining factor in their choice of inset.

The Negro groups showed little more than chance frequency in matching skin colors but did show significant differences in choice of white over black, white over brown, and even brown over black skin color. They also made more comments expressing preference and hostility for different skin colors.

Age differences in each group were, in general, in terms of accentuation of a group pattern already present at three years. For example, preference for white skin color in the white lower class group became more significant at five years than at three, and preference for brown over black in the Negroes showed a similar trend in increased significance. Age differences were less marked for the Negroes than the other two groups, suggesting that environmental influences directing attention to skin color may be effective earlier in Negro than in white groups.

Sex differences, though only significant in one comparison for upper white three-year-olds suggested some relationship with socio-economic status. White upper class girls and lower class boys showed more preference for white skins than white lower class girls and upper class boys.

The implications of the findings would seem obvious. Patterns of response to persons of different skin color are present as early as three years and become accentuated during the succeeding two years. Though living in a democracy, many Negro citizens apparently learn by three years of age that skin color is important, that white is to be desired, dark to be regretted. As for the white skinned citizens, what they learn in their first five years about skin color appears to be related to their parents' occupation, education, intelligence, and residential neighborhood. Young children of parents engaged in professions perceive skin color in cognitive terms, children of parents engaged in semi-skilled occupations perceive it in affective terms.

The writers prefer to delay interpretation of these group differences until similar groups of children in a southern state have been tested.

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APPENDIX

CHECK AND TABULATION SHEET USED FOR INDIVIDUAL CHILDREN

Young Children's Responses to People of Different Skin Color

Child's Name _____ Age _____
Parent's Occ. _____ Sex _____
Address _____ Skin Color _____
School _____ School Group _____
Experimenter _____ Teacher _____

	Picture	R L	Did Match a	Did Match b	Did Match c	No Match a	No Match b	No Match c	Summary
Person	1 A	b a							
	2 C	c a							
DATE	3 B	a c							
	4 A	b c							
	5 B	b a							
	6 C	b c							
Relative	1 B	c b							
	2 A	a b							
	3 C	b a							
	4 B	c a							
	5 C	c b							
	6 A	c a							
Person	1 C	a c							
	2 B	b c							
	3 A	c b							
	4 C	a b							
	5 A	a c							
	6 B	a b							
	Total								
Relative	1 B	a c							
	2 A	b c							
DATE	3 C	c b							
	4 A	c a							
	5 C	a c							
	6 B	b c							
Person	1 A	c b							
	2 C	a b							
	3 B	b a							
	4 C	b c							
	5 B	c b							
	6 A	a b							
Relative	1 C	b a							
	2 B	c a							
	3 A	a c							
	4 B	a b							
	5 A	b a							
	6 C	c a							
	Total								
Person	1 C	c b							
	2 B	a b							
DATE	3 C	a c							
	4 A	a b							
	5 C	b a							
	6 B	c a							
Relative	1 A	a c							
	2 C	b c							
	3 A	b a							
	4 B	b c							
	5 A	c b							
	6 C	a b							
Person	1 B	b a							
	2 A	c a							
	3 B	c b							
	4 C	c a							
	5 B	a c							
	6 A	b c							
	Total								
	Totals								

Preference

1 2 3 4 5 6

a
b
c

Totals

Negro Ident.	
B	C
a	a
b	b
c	c

Color Ident.
1
2
3

Match A B C